









7th CONGRESS  
FAR EASTERN ASSOCIATION OF  
TROPICAL MEDICINE

---

ABSTRACTS OF  
PAPERS  
AND  
PROGRAMME  
OF  
SCIENTIFIC SESSIONS



CALCUTTA  
December 5th to 10th  
1927





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PLAN  
OF  
CONGRESS BUILDINGS  
SHOWING  
INFORMATION BUREAU  
LECTURE ROOMS  
SCIENTIFIC EXHIBITION  
COMMERCIAL EXHIBITION  
Etc., Etc.

# SCIENTIFIC SECTIONS.

## SECTION I.

Clinical Medicine and Surgery, Ophthalmology, Dermatology, Gynæcology and Diseases of Pregnancy, Pathology, Mental Hygiene and Psychiatry, Radiology, Dentistry,

## SECTION II.

State Medicine and Hygiene, Child Welfare.

## SECTION III.

Plague, Cholera, Dysentery, Sprue, Intestinal Infections, Bacteriophage, Leprosy, Tuberculosis and Bacteriology.

## SECTION IV.

Malaria, Kala-azar, Protozoology, Typhus-like Diseases and Leptospiræ, Medical Entomology and Helminthology.

## SECTION V.

Nutrition, Deficiency and Endocrine Diseases, Immunology, Chemiotherapeutics, Rabies and Pharmacology.

## SECTION VI.

Veterinary.

## Rooms for Scientific Sessions.

- Room A.** Lecture Hall, 1st Floor, Congress Buildings.
- Room B.** Lecture Hall, 1st Floor, Anatomical Block.
- Room C.** Lecture Hall, Chemical Block.
- Room D.** Lecture Hall, School of Tropical Medicine Buildings.
- Room E.** Library, School of Tropical Medicine Buildings.
- Room F.** Room, Top Floor, Congress Buildings.
- Room G.** Room, Top Floor, Congress Buildings.

(See Map.)

# MONDAY, 5th DECEMBER.

Morning—11 a.m. to 1 p.m.

Section IA.

Room B.

## (MEDICINE.)

Paper Nos.

- 1 The Importance of Mixed Infections in the Tropics. By Lieut.-Col. Barnardo.
- 12 Disseminated Sclerosis in India. By Lieut.-Col. Sprawson.
- 9 Sur un cas de " Burning of the Feet." By Major Labernadie.
- 10 Deux Localisations Rares dans la Syphilis Hereditaire. By Major Labernadie.
- 3 The Scope of Digitalis in the Tropical Heart of Bengal. By Dr. Basu.

Afternoon—2 to 4 p.m.

- 14 Certain Clinical Signs in Cholera. By Dr. Tomb.
- 5 Present Day Treatment of Cholera. By Dr. Ganguly.
- 11 Epidemiology of Infantile Biliary Cirrhosis of the Liver. By Dr. Mukerji.

*(Papers not dealt with for want of time will be read on the morning of Wednesday in Room D.)*



## MONDAY, 5th DECEMBER.

Morning—11 a.m. to 1 p.m.

Section IB.

Room D.

(SURGERY.)

Paper Nos.

- 18 The Choice of Operation for Vesical Calculus. By Major-General Hooton.
- 17 The Surgical Aspects of Filariasis. By Sir Frank Connor.  
(Opening discussion.)
- 16 Surgical Pathology of Filariasis. By Major Chatterjee.
- 217 The Development of Gastric Surgery with special reference to Gastroduodenal Ulcer. By Dr. Wanless.

Afternoon—2 to 4 p.m.

Paper Nos.

- 15 Surgical Complications of Chronic and Latent Amœbiasis. By Major Chatterjee.
- 19 Surgery of the Tropical Diseases. By Dr. Maitra.
- 20 The Relief by Surgery of Endemic Ascites. By Capt. Nigam.

*(Papers not dealt with for want of time will be read on the morning of Wednesday in Room D.)*

## MONDAY, 5th DECEMBER.

Morning—11 a.m. to 1 p.m.

**Section IC.**

**Room F.**

**(DENTISTRY.)**

Paper Nos.

- 37 Oral Sepsis. By Dr. Taylor.
- 36 Some Observations on Pan-chewing, etc. By Dr. Modi.
- 35 The Habit of Pan-chewing. By Dr. Ahmed.

*(Papers unread in the morning can be read in the afternoon.)*

**Section II.**

(No Meeting.)

## MONDAY, 5th DECEMBER.

Morning—11 a.m. to 1 p.m.

Section III.

Room C.

### (PLAGUE.)

Paper Nos.

- 63 The Present Position of the Plague Problem. By Lieut.-Col. Mackie.  
(Opening of Combined Discussion between the F. E. A. T. M. and the League of Nations Plague Sub-committee).

Afternoon—2 to 4 p.m.

- 64 Problems of Pneumonic Plague. By Dr. Wu Lien Teh.  
65 Perpetuation of Plague in Wild Rodents. By Dr. Wu Lien Teh.  
62 Experiments in the Transmission of Plague by X. Cheopis and X. Astia. By Dr. Goyle.  
61 An Unrecognised Type of Plague. By Dr. Choksy.

*(If the section on plague is not concluded it will be continued in the morning and if necessary in the afternoon of Tuesday in Room F.)*

## MONDAY, 5th DECEMBER.

Morning—11 a.m. to 1 p.m.

### Section IV.

Room A.

#### (MALARIA: CONTROL.)

Paper Nos.

- 129 The Future of Malaria Control in the Malay Peninsula.  
By Sir Malcolm Watson.  
(Opening discussion.)
- 115 Anti-malarial Measures in Poverty Stricken Regions.  
By Lieut.-Col. James.
- 122 Malaria Mosquito Control in Rural Singapore. By Dr.  
Scharff.

Afternoon—2 to 4 p.m.

- 113 The Theory and Practice of Malaria Control. By Lieut.-  
Col. Gill.
- 127 The Success of a Scheme based on Systematic and  
Bionomic Knowledge of Anophelines. By Dr Strick-  
land.
- 118 On the Malarial Endemic in the Central Part of Japan.  
By Col. Katsuno.
- 114 Malaria Outbreak in the Off-Season. By Lieut.-  
Col. Clemesha.
- 120 Malaria Survey of a Group of Tea Gardens in Assam.  
By Dr. Ramsay.
- 114 Malaria Survey of Part of the Lower Bengal Delta.  
By Mr. Iyengar.

*(Papers not dealt with for want of time will be read on the afternoon  
of Wednesday in Room A and if necessary on Thursday in  
Room G.)*

# MONDAY, 5th DECEMBER.

**Morning—11 a.m. to 1 p.m.**

**Section V.**

**Room E.**

## (NUTRITION.)

**Paper Nos.**

- 225 Diseases of Faulty Nutrition. By Lieut.-Col. McCarrison.  
(Opening discussion.)
- 173 Basal Metabolic Rate for Indians. By Major Sokhey.
- 167 Relative Values of National Diets in India. By Lieut.-Col. McCarrison.
- 169 Effects of Faulty Foods deficient in Vitamins on the Gastro-Intestinal Tract. By Lieut.-Col. McCarrison.

**Afternoon—2 to 4 p.m.**

- 172 Note on Iodine Metabolism. By Major Clive Newcomb and Ganpati Sankaran.
- 165 Preliminary Note on Inter-relationship of some of the Endocrine Glands in Sugar Metabolism. By Dr. Bose.
- 168 Effect of Manganese on Growth. By Lieut.-Col. McCarrison.
- 166 Experimental Production and Prevention of Stone-in-the-Bladder in Rats. By Lieut.-Col. McCarrison.
- 171 New Growths in the Stomach of Deficiently Fed Rats. By Lieut.-Col. McCarrison.

*(Papers not dealt with for want of time will be read on the morning of Saturday in Room G.)*

## TUESDAY, 6th DECEMBER.

Morning—10 a.m. to 1 p.m.

Section IA.

Room B.

### (MEDICINE: CONTINUED.)

Paper Nos.

- 2 Enteric Fever. By Lieut.-Col. Barnardo.
- 6 Rôle of Gold Salts in the Treatment of Pulmonary Tuberculosis. By Dr. Kesava Pai.
- 7 Seasonal Variations in Weight in Pulmonary Tuberculosis. By Dr. Kesava Pai.
- 8 Cancer Diagnosis by the so-called Urine Diagnosis. By Dr. Kiutsi.

### (DERMATOLOGY.)

- 26 My Experience of Dermatology in the Tropics. By Dr. Gupta.

Afternoon—2 to 4 p.m.

### (PATHOLOGY.)

- 13 Diabetes in the East. By Major Stott.  
(Opening discussion.)
- 4 Diabetes in Bengal. By Dr. Dutta.
- 228 Some Observations on Indians in regard to the Sugar Content of the Blood and the Sugar Tolerance. By Capt. S. L. Bhatia.

*(Papers not dealt with for want of time will be read on the morning of Thursday in Room G.)*

## **TUESDAY, 6th DECEMBER.**

**Morning—10 a.m. to 1 p.m.**

**Section IB.**

**Room D.**

### **(OPHTHALMOLOGY.)**

Paper Nos.

- 21     Glaucoma in Calcutta. By Lieut.-Col. Coppinger.
- 23     Glaucoma as a complication of Epidemic Dropsy. By Dr. Mukerjee.
- 24     Ocular Tension. By Major Clive Newcomb and Capt., Verdon.
- 22     Ocular Complications in Leprosy. By Major Kirwan.
- 222    Mooren's Ulcer: Pathogenesis and Treatment. By Dr. B. N. Bhaduri.
- 223    Ocular Findings in Amoebic Dysentery. By Dr. B. N. Bhaduri.

**Afternoon—2 to 4 p.m.**

### **(GYNÆCOLOGY AND DISEASES OF PREGNANCY.)**

- 221    Operative Midwifery in pre-Chamberlen days with a Special Reference to Ancient India. By Dr. Kedarnath Das.
- 54    Some Diseases of Pregnancy in India with Special Reference to Communities. By Dr. Margaret Balfour.
- 56    Bacteriological Examination of some Discharges from Cases of Anæmia of Pregnancy, Normal Pregnancy, etc. By Dr. Emanuelov and Dr. Metha.
- 220    Osteomalacia in India. Dr. A. C. Scott.
- 229    Vesico-vaginal fistula. By Dr. M. V. Webb.

*(Papers not dealt with for want of time will be read on the morning of Thursday in Room G.)*

**Section II.**

**(No Meeting.)**

# TUESDAY, 6th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

**Section IIIA.**

**Room C.**

## (CHOLERA.)

Paper Nos.

- 71 Statistical Studies in the Epidemiology of Cholera. By Lieut.-Col. Russell.
- 69 History of Cholera Epidemic in Formosa since 1895. By Dr. Kiribayashi.
- 67 L'Epidemic de Cholera au Tonkin en 1927. By Dr. Jourdran.
- 68 Cholera in Hardwar. By Dr. Khan and Lieut.-Col. Dunn.
- 72 Bacteriology and Epidemiology of Cholera in Asansol Mining Settlement. By Dr. Toml and Capt. Maitra.

**Afternoon—2 to 4 p.m.**

Paper Nos.

- 70 De l'Agglutination des Vibrios Choleriques par le Serum des Bilivaccines. By Major Labernadie.
- 73 Action of Serum of Cholera Convalescents on Comma Vibrios. By Dr. Ukil.
- 66 Non-agglutinating Vibrios, their relation to the Typical Vibrio Cholerae. By Dr. Brahmachari.

*(Papers not dealt with for want of time will be read on the morning of Friday in Room G.)*

**Morning—10 a.m. to 1 p.m.**

**Section IIIB.**

**Room F.**

*(Will meet if necessary to complete papers or discussion on Plague.)*

**Afternoon—2 to 4 p.m.**

*(Will meet if necessary to complete papers or discussion on Plague.)*



## TUESDAY, 6th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

**Section IV.**

**Room A.**

### (MALARIA: GENERAL)

**Paper Nos.**

- 117 Habits of Anophelines in Relation to their Rôle in the Spread of Malaria. By Lieut.-Col. James.  
(Opening discussion.)
- 113 Progress towards the Realisation of Biological Control of Mosquito Breeding. By Mr. Senior-White.
- 130 Organic and other Chemical Factors which influence the Breeding of Anopheles, etc. By Mr. Williamson.
- 110 Why do Anopheles larvæ feed at the Surface—and How? By Lieut.-Col. Christophers and Mr. Puri.
- 108 Initial Seasonal Appearance of Malaria in a selected Area in India. By Dr. Bruce Mayne.
- 107 Experimental Attempts to transmit through Mosquito Biting Experimentally. By Dr. Bruce Mayne.

**Afternoon—2 to 4 p.m.**

- 109 Summary of what is known regarding the Spleen Rate and Average Enlarged Spleen. By Lieut.-Col. Christophers.
- 121 Immunity in Malaria. By Dr. Sarkar.
- 126 Effects of Treatment on Incidence and Degree of Splenic Enlargement. By Major Sinton.
- 112 Measurement of the Enlarged Spleen in Adults. By Major Covell.

*(Papers not dealt with for want of time will be read on the afternoon of Wednesday in Room A and if necessary on Thursday in Room G.)*

## TUESDAY, 6th DECEMBER.

Morning—10 a.m. to 1 p.m.

Section V.

Room E.

### (DEFICIENCY DISEASES, ETC.)

Paper Nos.

- 180 Epidemic Dropsy: its bearing on the Beri-beri Problem.  
By Lieut.-Col. Megaw.
- 175 Prophylaxis and Cure of Beri-beri by Vitamin Preparations.  
By Dr. Jansen and Dr. Donath.
- 181 Index of Beri-beri Preventing Rice. By Lieut.-Col. Vedder.
- 170 Vitamin Content of Whole Rice. By Lieut.-Col. McCarrison.
- 211 Experimentelle Studien uber Reissshaden an Tauben, etc.  
By Dr. A. Kessler.
- 176 Beri-beri Columbarum. By Lieut.-Col. McCarrison.

Afternoon—2 to 4 p.m.

- 174 The Causation of Lathyrism by *Vicia sativa*. By Lieut.-Col. Acton and Major Chopra.
- 179 Salt Licks. By Major Clive Newcomb.
- 177 Lymph-Adenoid Goitre. By Lieut.-Col. McCarrison.
- 178 Relationship of Iodine to Endemic Goitre of Himalayan India. By Lieut.-Col. McCarrison.

*(Papers not dealt with for want of time will be read on the morning of Wednesday in Room G.)*

# WEDNESDAY, 7th DECEMBER.

• Morning—10 a.m. to 1 p.m.

## Section I.

Room D.

(Will meet if necessary to complete reading of papers on Medicine and Surgery.)

Morning—10 a.m. to 1 p.m.

## Section II.

Room B.

### (STATE MEDICINE: GENERAL AND SPECIAL HYGIENE.)

Paper Nos.

- 42 The International Aspect of Disease with Special Reference to Quarantine. By Col. Graham.  
(Opening discussion.)
- 215 Quarantine Conditions in the Port of Calcutta. By Dr. J. Borland McVail.
- 46 Sanitary Management of the Principal Pilgrim Centres in the Bombay Presidency. By Dr. Munsiff.  
Recent Statistical Report of the Health of the Imperial Japanese Navy. By Dr. Takasugi.
- 53 The Activities of the Medical and Sanitary Organisation of the Chinese Eastern Railway. By Dr. Wei Likun.
- 41 Tropical Diseases of Northern Manchuria. By Dr. Ginzton.

Afternoon—2 to 4 p.m.

- 48 Cholera Bili-vaccine and Anti-cholera Vaccine. By Lieut.-Col. Russell.
- 45 Aspects Cliniques et Epidemiologiques de la Meningitis Cerebrospinale Epidemique dans l'Inde Portugaise. By Col. de Mello.
- 47 The 'Time Factor' in Disinfection, Disinsectization, etc. By Major Phipson, I.M.S.

*(Papers not dealt with for want of time will be read on the afternoon of Friday in Room F.)*

## WEDNESDAY, 7th DECEMBER.

Morning—10 a.m. to 1 p.m.

### Section III.

Room C.

#### (DYSENTERY, SPRUE AND INTESTINAL INFECTIONS.)

Paper Nos.

- 77 On the Dysenteries in Bengal. By Dr. Ukil.
- 75 Recent Work on Sprue. By Lieut.-Col. Mackie.
- 76 Blood Transfusion in the Treatment of Sprue. By Dr. Manson-Bahr.
- 74 Treatment of Tropical Gastro-Intestinal Infections. By Dr. Choksy.

#### (BACTERIOPHAGE.)

- 78 Bacteriophage and Bacteriophagy. By Dr. D'Herelle.

Afternoon—2 to 4 p.m.

- 79 Pathology and Epidemiology of Infectious Intestinal Diseases in Particular Cholera and Bacillary Dysentery. By Dr. D'Herelle.
- 80 Bacteriophage as a Specific in the Treatment and Prophylaxis of Cholera and Bacillary Dysentery. By Dr. D'Herelle.
- 81 The Therapeutic Use of Bacteriophage in Dysentery in Rangoon. By Lieut.-Col. Morison.

*(Papers not dealt with for want of time will be read on the morning of Friday in Room G.)*

## WEDNESDAY, 7th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

**Section IV.**

**Room A.**

### **(MALARIA: TREATMENT.)**

Paper Nos.

- 116 Experiments in the Treatment of Malaria in England.  
By Lieut.-Col. James.
- 125 Treatment of Malarial Fevers. By Major Sinton.
- 106 Action of Quinine on the Malarial Parasites. By Lieut.-  
Col. Acton and Major Chopra.
- 128 Efficiency in Malaria Treatment: the Merits of Silver-  
salvarsan. By Dr. Surbek.
- 124 Report on Grave Cases of M. T. treated with Intravenous  
Injections of Quinine. By Dr. Shaha.

**Afternoon—2 to 4 p.m.**

- 119 Rapport sur les Resultats du Traitement de divers etats de  
Paludisme par la Smalarina. By Col. de Mellp.
- 208 On the Chronicity of Malaria in Formosa. Dr. K.  
Moresbeta.

*(Will meet if necessary to dispose of unread papers on the afternoon  
of Thursday in Room G.)*

## WEDNESDAY, 7th DECEMBER.

Morning—10 a.m. to 1 p.m.

Section V.

Room E.

### (IMMUNOLOGY AND CHEMOTHERAPY.)

Paper Nos.

- 186 On some Factors Influencing the Therapeutic Value of Salvarsan. By Prof. Hata.
- 182 Relation between Chemical Constitution of Antimonials and their Therapeutic Properties. By Dr. Brahmachari.
- 183 Chemotherapy of Bubonic Plague. By Father Caius and Dr. Naidu.
- 190 Further Evidences on Lipoidophile Antigen-Antibody Reaction. By Prof. Taniguchi.
- 185 Development and Duration of Immunity by Inoculation and Re-inoculation. By Lieut.-Col. Harvey and Capt. Iyengar.

Afternoon—2 to 4 p.m.

- 189 Some Clinical Aspects of the Wassermann Test. By Major Lloyd.
- 184 Physical Properties of Normal and Pathological Sera. By Major Chopra and Chaudhury.
- 187 La Syphilimetry (Method de Vernes). By Major Labernadie.
- 188 Reaction de Wassermann sans Etuve. By Major Labernadie.
- 218 The Use of Aethoxydiaminoacridinlactate in Tropical Coletes. By Dr. O. Urchs.

*(Papers not dealt with for want of time will be read on the afternoon of Friday in Room G.)*

## WEDNESDAY, 7th DECEMBER.

Morning—10 a.m. to 1 p.m.

Section VI.

Room F.

### (VETERINARY.)

Paper Nos.

- 200 Infectious Animal Diseases and their Control in Japan. By Dr. Nakamura.
- 198 Bovine Tuberculosis in India. By Dr. Edwards.
- 205 Virulence of Tubercle Bacilli isolated from Cattle in India. By Dr. Soparkar.
- 207 Morphology of the Virus of Contagious Peripneumonia of Cattle. By Dr. Taniguchi.
- 199 An Improved Vaccine for Immunization against Rinderpest. By Major Kelser.

Afternoon—2 to 4 p.m.

- 206 The Treatment of Canine Piroplasmosis. By Major Stirling.
- 197 Multiceps Serialis Gregerii in Animals other than Rabbit, Squirrel, etc. By Dr. De.
- 203 Gastroenteritis hæmorrhagica in the Cattle of Formosan Milkers. By Dr. Miyamoto.
- 204 Urocystitis hæmorrhagica of Native Cattle. By Dr. Miyamoto.
- 214 Rhinosporidiosis in Cattle. By V. Krishnamurti.

*(Papers not dealt with for want of time will be read on the morning of Thursday in Room F.)*

## THURSDAY, 8th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

**Section I.**

**Room D.**

### (MENTAL HYGIENE AND PSYCHIATRY.)

Paper Nos.

- 28 Mental Hygiene for Europeans in the Tropics. By Lieut.-Col. Berkeley Hill.
- 29 Role of Indian Hemp in Causation of Insanities in India. By Capt. Dhunjibhoy.
- 30 The Mental Factor in Disease. By Dr. Nunan.
- 31 Report on a Case of Communicated Insanity. By Dr. Parasuram.

**Afternoon—2 to 4 p.m.**

**Room F.**

### (RADIOLOGY.)

- 33 Utilite des examens Radioscopiques, repele au cours des Affections Cardio-Vasculaires des Beriberiques. By Dr. Jourdran.
- 32 Radiological Appearances found in certain Tropical Diseases. By Dr. Galstaun.
- 34 Results of Radium Treatment in Uterine Fibroids and Metropathia • Hæmorrhagica in Bengal. By Dr. Maitra.

*(Papers not dealt with for want of time will be read on the morning of Saturday in Room D.)*



## THURSDAY, 8th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

### **(STATE MEDICINE: GENERAL AND SPECIAL HYGIENE.)**

Paper Nos.

- 50 Experimental Observations on 'Activated Sludge' in Calcutta. By Lieut.-Col. Stewart.
- 49 Population and Public Health in India. By Lieut.-Col. Russell.
- 44 A Health Campaign among 7,000 Tea Garden Coolies. By Dr. Leitch.
- 39 De-Ratting of Ships. By Dr. Crow.
- 52 The Medical Inspection of Indian School Children at Simla. By Major Webb.

**Afternoon—2 to 4 p.m.**

- 219 Birth-rate and Mortality of Europeans in N. E. I. By Dr. Winckel.
- 40 Incidence of Pulmonary Tuberculosis in Multan City, etc. By Dr. Gian Singh.
- 43 Experimental Studies on the Entrance Path of Small-pox. By Prof. Nakarmura.
- 38 A Statistical Enquiry into School Myopia. By Dr. Bannerji.

*(Papers not dealt with for want of time will be read on the afternoon of Friday in Room F.)*

## THURSDAY, 8th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

**Section III.**

**Room C.**

### (LEPROSY.)

Paper Nos.

- 90 The Treatment and Prevention of Leprosy. By Dr. Muir.  
(Opening discussion.)
- 83 La Lepre a Pondicherry. By Col. Goyon and Major Labernadie.
- 85 Serologie of Leprosy. By Col. Goyon and Major Labernadie.
- 86 The Iodide Treatment of Leprosy. By Dr. Muir.
- 87 Subsidiary Uses of Potassium Iodide in Leprosy. By Dr. Muir.
- 84 Some Hæmatological Aspects of Potassium Iodide Treatment of Leprosy. By Dr. Henderson.
- 88 Sedimentation Test in Leprosy. By Dr. Muir.
- 92 On the Curative Value of the Tubercle Bacillary Autolysate in Leprosy. By Dr. Row.

### Afternoon—2 to 4 p.m.

- 82 Leper Settlement Development. By Dr. Donaldson.
- 91 The Propaganda-Treatment-Survey Centre as a means of dealing with Leprosy. By Dr. Muir.
- 89 Reaction in Leprosy and its Control by Antimony and other Metals. By Dr. Muir.
- 93 Leprosy in Travancore. By Dr. Tampi.

*(Papers not dealt with for want of time will be read on the morning of Friday, in Room G.)*

## THURSDAY, 8th DECEMBER.

Morning—10 a.m. to 1 p.m.

Section IV.

Room A.

### (KALA-AZAR.)

Paper Nos.

- 134 The Kala-azar Transmission Problem and the Factor of Resistance. By Lieut.-Col. Knowles.  
(Opening discussion.)
- 135 De la Propagation en U. S. S. R. du Kala-azar et du Bouton d'Orient. By Prof. Marzinowsky.
- 136 Life-History of *Leishmania donovani* in its Insect and Mammalian Hosts. By Major Shortt.
- 133 Experimental Transmission of Oriental Sore (with generalised infection) in Laboratory Animals. By Dr. Das Gupta.
- 132 Observations on the Diagnostic Value of the Antimony Test for Kala-azar. By Major Chopra, Gupta and Basu.
- 131 Action of Pentavalent Compounds of Antimony on the *Leishmania donovani* Parasites. By Major Chopra and Lieut.-Col. Acton.

*(Papers not dealt with for want of time will be read on the morning of Saturday in Room A.)*

Afternoon—2 to 4 p.m.

### (HELMINTHOLOGY.)

- 160 Ento-parasites found in the Tarabagan. By Dr. Li Yuan Po.
- 159 Les Helminthiases a Pondicherry. By Dr. Labernadie.
- 158 Some Cases of Strongyloidosis and the Treatment with Gentian Violet. By Dr. Kwa Tjoan Sioe.
- 164 Present Status of *Sauricola* and *Echinopharynx*. By Dr. Thapar.

*(Papers not dealt with for want of time will be read on the morning of Saturday in Room E.)*

# THURSDAY, 8th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

**Section V.**

**Room E.**

## **(RABIES AND ANTI-RABIC TREATMENT.)**

Paper Nos.

- 191 The Action of Ether on Rabies Virus. By Lieut.-Col. Cunningham, Asst. Surg. Nicholas and Lahiri.

## **(PHARMACOLOGY.)**

- 195 Ephedrine. By Prof. Read.  
193 Pharmacological Action of Cinchona Alkaloids on the Heart and Uterus. By Major Chopra, David and Diksit.  
192 A Retrospect of Six Years' Research on Indigenous Drugs. By Major Chopra.  
196 Observations on the Stability of Chloride of Lime, etc., in the Plains of Bengal. By Dr. Tomb.  
194 The Opium Habit in India. By Major Chopra and Grewal.

**Afternoon—2 to 4 p.m.**

- 212 Studien über das Synthetische analptikum Cardiazol. By Dr. A. Kessler.  
213 Über Ephedrin und das Synthetische Ephetonin. By Dr. A. Kessler.  
214 Chinese Drugs. By Dr. Kubota.

*(Papers not dealt with for want of time will be read on the afternoon of Friday in Room G.)*

**Morning—10 a.m. to 1 p.m.**

**Section VI.**

**Room F.**

## **(VETERINARY: CONTINUED.)**

Paper Nos.

- 201 Strongyloidosis intestinalis of Formosan Farrow. By Dr. Miyamoto.  
202 Balantidiosis coli beim jungen Schweine in Formosa. By Dr. Miyamoto.

*(If necessary unread papers will be dealt with on the morning of Saturday in Room F.)*

## FRIDAY, 9th DECEMBER.

### Section I.

(No Meeting.)

**Morning—10 a.m. to 1 p.m.**

### Section II.

**Room B.**

#### **(MATERNITY AND CHILD WELFARE.)**

Paper Nos.

- 58 • Statistiques de la Maternité de l'Hôpital japonais pour les années 1924, 1925, 1926. By Dr. Jourdan.
- 57 Des Indications de l'Emploi des Injections de Post Hypophyse chez le parturient épuisé par les Chaleurs de l'été dans le Delta Tonkinois. By Dr. Jourdan.
- 60 The Organisation of Child Welfare Work. By Dr. Young.  
(Opening discussion.)
- 55 Child Maternity and Child Welfare in the United Provinces. By Dr. Commissariat.
- 59 Maternity and Child Welfare. By Dr. Ranade.

**Afternoon—2 to 4 p.m.**

- 227 Some Suggestions for the further Development of Child Welfare Work in Bengal. By Dr. Headwards.
- 226 Organisation of Child Welfare Work. By Dr. Tilak.

*(Papers not dealt with for want of time will be read on the morning of Saturday in Room B.)*

# FRIDAY, 9th DECEMBER.

Morning—10 a.m. to 1 p.m.

Section IIIA.

Room C.

## (BACTERIOLOGY.)

Paper Nos.

- 99 A Comparative Study on Leptospiræ. By Prof. Inada.
- 100 Colour Variations in the Fungus of Dhobies' Itch. By Dr. McGuire.
- 103 The Malassezia of the Skin, etc. By Dr. Panja.
- 98 The Streptococci and their Importance in the Treatment of Tropical Diseases. By Dr. Bannerjee.
- 102 Sur le Commensalisme de la Faune Spirochætique dans les Arcades Dentaire, etc. By Col. de Mello.

Afternoon—2 to 4 p.m.

- 97 The Criptococcus. By Dr. Bannerjee.
- 101 Note on the Preparation of Mutton Broth with Papain. By Major Martin.
- 105 On the Anærobic Bacteriologic Flora of certain Cases of Cellulitis and Gangrene. By Dr. Ukil.
- 104 Actinomyces hominis. By Dr. Sur.

*(Papers not dealt with for want of time will be read on the morning of Saturday in Room C.)*

Morning—10 a.m. to 1 p.m.

Section IIIB.

Room F.

## (TUBERCULOSIS.)

Paper Nos.

- 216 Some Clinical Observations pertaining to Intestinal Tuberculosis in India. By Dr. Wanless.
- 95 Incidence of Types of Tuberculosis met with in Bengal. By Dr. Ukil.
- 96 Prevention of Tuberculosis in India. By Dr. Ukil.
- 94 Exposition of a Study of Dr. Léger of Paris on the Tuberculo-Reaction de Vernes. By Major Labernadie.

## FRIDAY, 9th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

**Section IVA.**

**Room D.**

### (PROTOZOOLOGY.)

Paper Nos.

- 209 A New Method of Staining the Malaria Parasite. By Dr. Grauert.
- 139 Influence of the Thyroid Gland on the Course of a Protozoal Infection. By Lieut.-Col. Knowles.
- 138 Preliminary Observations on the Morphology and Life-History of *Spirochæta anserina*. By Lieut.-Col. Knowles.
- 140 *Trichonymphides* de l'Intestine de *Leucotermes indicola*. By Col. de Mello.

**Afternoon—2 to 4 p.m.**

### (PSEUDOTYPHUS, YELLOW FEVER, ETC.)

Paper Nos.

- 142 Typhus-like Fevers conveyed by Ticks. By Lieut.-Col. Megaw.
- 144 A Pseudotypus Epidemic in Southern Queensland. By Dr. Strickland.
- 143 An Attempt to Transmit *Leptospira Icterohæmorrhagica* by *Aedes argenteus* and *Aedes albopictus*. By Dr. Kingsbury.
- 210 Experimental Yaws and a Study of the Immunity to Yaws. By Dr. Otto Schöbl.
- 141 The Diagnosis of Yellow Fever. By Prof. Hoffmann.

*(Papers not dealt with for want of time will be read on the morning of Saturday in Room A.)*

## FRIDAY, 9th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

**Section IVB.**

**Room E.**

### **(MEDICAL ENTOMOLOGY.)**

Paper Nos.

- 145 The Morphology of the Buccal Cavity of the Mosquito.  
By Mr. Barraud and Major Covell.
- 151 Some Anopheles of Sarawak. By Dr. Stookes.
- 146 Regional Distribution of Anophelines and Malaria in  
Bengal. By Mr. Iyengar.
- 148 Parasitic Nematodes of Anopheles. By Mr. Iyengar.
- 147 Protozoan Parasites of Anopheles. By Mr. Iyengar.

**Afternoon—2 to 4 p.m.**

- 149 The Classification and Identification of Members of the  
Genus Phlebotomus, etc. By Major Sinton.
- 150 The Breeding of Sandflies in Nature and in the Laboratory.  
By Dr. Smith.

*(Papers not dealt with for want of time will be read on the morning  
of Saturday in Room E.)*



## FRIDAY, 9th DECEMBER.

**Morning—10 a.m. to 1 p.m.**

**Section IVC.**

**Room A.**

### (HELMINTHOLOGY.)

Paper Nos.

- 154 Correlation between size of Hookworm Egg Counts and the Degree of Anaemia, etc. . By Dr. Kendrick.
- 162 Notes on a Quantitative Hookworm Survey of Ceylon. By Dr. Sweet.
- 155 Relation of Ankylostome Infection to Physical Features, etc. By Dr. Korke.
- 156 Correlation between Ankylostome Disease and Hæmoglobin Value, etc. By Dr. Korke.
- 163 Ankylostomiasis in Pariah Dogs. By Dr. Thapar.

**Afternoon—2 to 4 p.m.**

- 153 Recent Work on Schistosomiasis. By Dr. Fairley and Lieut.-Col. Mackie.
- 151 Filaria Malayi n.sp. parasitic in Man in the Malay Archipelago. By Col. Brug.
- 161 Filarial Infection and Disease due to Filaria bancrofti in Calcutta. By Dr. Sundar Rao.
- 157 Prevalence of Filariasis in Some Areas of British India. By Dr. Korke.

*(Papers not dealt with for want of time will be read on the morning of Saturday in Room E.)*

**Afternoon—2 to 4 p.m.**

**Section II.**

**Room F.**

(Will meet if necessary for papers as yet unread in State Medicine and Hygiene.)

# SATURDAY, 10th DECEMBER.

**Morning—10 a.m. to 11-45 a.m.**

**Section I.**

**Room D.**

Any unread papers in Mental Hygiene and Radiology.  
Conclusion of Section.

**Morning—10 a.m. to 11-45 a.m.**

**Section II.**

**Room B.**

Any unread papers in Maternity and Child Welfare.  
Conclusion of Section.

**Morning—10 a.m. to 11-45 a.m.**

**Section III.**

**Room C.**

Any unread papers in Bacteriology.  
Conclusion of Section.

**Morning—10 a.m. to 11-45 a.m.**

**Section IV.**

**Room A.**

Any unread papers in Kala-azar and Protozoology.  
Conclusion of Section.

**Morning—10 a.m. to 11-45 a.m.**

**Section V.**

**Room E.**

Any unread papers in Medical Entomology and Helminthology.  
Conclusion of Section.

**Morning—10 a.m. to 11-45 a.m.**

**Section VI.**

**Room F.**

Any unread papers in Veterinary Science.  
Conclusion of Section.



## TITLE AND ABSTRACTS.

*These are arranged alphabetically according to authors' names under the following headings.*

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DERMATOLOGY .. .	14	29—
PATHOLOGY .. .	14	30—
MENTAL HYGIENE AND PSYCHIATRY .. .	15	31— 34
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Papers of the titles or abstracts which have reached the Management too late to include in the classified list here published will so far as possible be published in an unclassified supplementary list.



## MEDICINE.

• 1. The importance of recognising that the practice of medicine in the Tropics is complicated by the almost universal occurrence of Mixed or Multiple Infections; as distinguished from the Simple Infections as met with in Temperate Climates. **Barnardo, F. A. F.**, Lt.-Col., C.I.E., C.B.E., I.M.S. (*Principal and Prof. of Medicine, Medical College, Calcutta*).

The recognition and importance of the main mixed infections met with in the tropics will be defined in detail.

2. Enteric Fever. **Barnardo, F. A. F.**, Lt.-Col., C.I.E., C.B.E., I.M.S. (*Principal and Prof. of Medicine, Medical College, Calcutta*).

The difficulties and importance of early diagnosis—especially emphasising the value of the pathologist at every stage in the disease.

Some new ideas as to the treatment with a view to lessening the occurrence and severity of the complications which are so distressing to the clinician in this disease.

• 3. The Scope of Digitalis in the Tropical Heart of Bengal. **Basu, U. P.**, M.B., M.R.C.P. (*Teacher of Medicine, Calcutta Medical School*).

Tropical Heart studied under two conditions:—

(i) Under normal conditions:—

(a) A series of 50 cases comprising healthy adult Bengali males and females were examined thoroughly and any abnormality detected in the system noted. The heart was especially examined. The position of the apex-beat noted. The heart sounds carefully auscultated, exercise tolerance estimated. The rate and rhythm of the pulse recorded. Blood Pressure and pulse tracings taken. The heart x-rayed and electro-cardiographed.

Control examination on exactly similar lines was carried on with 25 Europeans.

(b) A series of 50 hearts were obtained from persons between 25-35 years of age who had been enjoying perfect health and died suddenly as the result of accident.

Their morbid anatomy and histopathology studied. Control study was made on 10 European hearts, collected under exactly similar conditions.

(ii) Under diseased conditions:—

(a) Table of analysis showing the common cardiac disorders attending the heart clinics of Calcutta. Comparison of such cardiac disorders with those seen in the heart clinics of London.

(b) Table of analysis showing the common cardiac disorders met with as complications in the course of various acute and chronic diseases of Bengal.

Comparison of such cardiac complications with those that are met with during the course of acute and chronic diseases of the United Kingdom.

(c) Table of analysis showing the common changes in the heart present during the autopsies conducted in the Hospitals of Bengal. Comparison of such post-mortem findings with those met with in the autopsies conducted in the British Hospitals. Present day knowledge about the use and effects of Digitalis in the disease of the heart.

Clinical experience with Digitalis.

4. Diabetes in Bengal. Dr. **Dutta, M. M.** (*Teacher of Physiology, Campbell Medical School, Calcutta*).

(i) Diabetes in Bengal.

(ii) Etiology of Diabetes.

(iii) Treatment: medical diabetes, surgical diabetes.

(iv) Detailed study of Insulin Treatment.

5. The Present Day Treatment of Cholera in Calcutta. **Ganguly, Rai Lal Behari**, Bahadur (*Teacher of Medical Jurisprudence and in Charge Infectious Wards, Campbell Hospital*).

6. The Role of Gold Salts in the Treatment of Pulmonary Tuberculosis. **Kesava Pai, M.**, M.D., Rao Bahadur and **Gunasagaram, P. K.** I.M.P., Sub-Assistant Surgeon (*From the Tuberculosis Hospital, Madras*).

43 cases of pulmonary tuberculosis have been treated with Sanocrysin and 41 with Krysolgan, with beneficial results in 31 of the Sanocrysin cases (72 per cent.) and 22 of the Krysolgan series (53 per cent.).

Of the 43 Sanocrysin cases the condition became arrested in 9, much improved in 10 and slightly improved in 12. 12 were either unaffected or became worse. Of the 41 Krysolgan cases, the condition of none was arrested, 11 were much improved, 11 slightly improved and 19 were unaffected or became worse.

Whilst it cannot be said that either of the two gold salts has a specific effect on the disease, it cannot be denied that they form a valuable adjunct to other forms of treatment, especially that by artificial pneumothorax. Whilst the more diseased lung is kept under control by the pneumothorax collapse, the less affected lung can be influenced with the gold compound.

Whilst Sanocrysin produces no severe reactions in moderate doses, Krysolgan is more toxic and gives more unpleasant effects even when administered in much smaller doses than Sanocrysin. Hæmoptysis and abdominal symptoms were particularly frequent under Krysolgan treatment.

Though, of the two drugs, Sanocrysin is the more effective, neither can be said to produce the marked and decisive results of pneumothorax therapy. But the value of gold treatment consists in its applicability to bilateral and miliary cases where pneumothorax cannot be employed.

Sanocrysin is of greater value in the exudative cases whilst Krysolgan seems to have a better effect in the fibrosing cases. This is presumably due to Sanocrysin acting chemically whilst Krysolgan acts catalytically stimulating further fibrosis.

9 cases out of 39 became bacillus negative in the Sanocrysin series and 7 out of 35 in the Krysolgan series. These results are not decidedly superior to those obtained by ordinary treatment and are certainly inferior to those resulting from pneumothorax therapy.

7. On the Seasonal Variations in Weight in Pulmonary Tuberculosis under Hospital Conditions in Southern India. **Kesava Pai, M., M.D.,** Rao Bahadur, and **Venugopal, C. A., L.M. & S.,** Civil Assistant Surgeon (*From the Tuberculosis Hospital, Madras*).

The observations forming the subject of the paper were made in the Tuberculosis Hospital of Madras, during the years 1923-1927.

Clinical observations in the Tuberculosis Hospitals of colder countries have shown that in the case of patients suffering from tuberculosis and treated under hospital conditions, the weight and general condition of the patients bear a definite relation to the seasons of the year. Whilst the body weight seems to decrease in winter and the hottest part of summer, it tends to increase during spring, in early summer and in the autumn.

In a hill climate in the tropics like that of Madanapalle it has also been shown that whilst patients lose weight during the hotter summer months, they increase in weight during the cooler monsoon months and put on further weight in the still cooler months of September to March.

In the strictly tropical climate of Madras City the observations go to prove that corresponding to the hot and dry summer months of March to September there is a fall in the weight curve and to the cooler and more humid months October to February a rise in the same curve.

Taking the observations made in different climates conjointly into consideration it is evident that there are normal variations in weight corresponding to the seasons, the variations in the curves corresponding to the number of the seasons in the country where the observations are made.

Whatever be the climate, the factors concerned in the variations in weight are identical. Extremes of heat and cold cause a fall of body weight. Dryness of the air is conducive to loss of fat and consequent loss of weight whilst relative humidity tends to increase the body weight. Gain of weight and improvement in tuberculosis therefore depend on the temperature and the humidity that are conducive to maximum comfort and optimum metabolic activity, whilst loss of weight and retardation of improvement result from the opposite set of conditions, viz., extremes of temperature and dryness of the air especially in the height of summer.

8. Cancer Diagnosis by the So-called Urine Diagnosis. Prof. Dr. **Kiutai, M.** (*Institute for Urobiology in Hakodate, Hakkaido, Japan*).

Urine is mixed with blood charcoal and filtered, a small quantity of tartaric acid is added 0.01 gram of the stained dried substratum of cancer tumour i.e., chromocancerin is added and the mixture allowed



to stand without being shaken—the substratum floats at the surface. If the liquid shows a slight red colour up to 30 minutes the reaction is positive.

**9.** Sur un Cas de “ Burning of the Feet.” **Labernadie, V. G. F.,** Major (*Chef du Laboratoire de Pondicherry, Etablissements français dans l'Inde*).

Sous le nom de “ Burning of the feet ” les anciens praticiens avaient confondu un certain nombre de polyneurites frustées des membres inférieurs où une recherche étiologique serrée mettrait de nos jours en évidence, soit la syphilis, soit le diabète si fréquents aux Indes, soit le béri-béri, l'alcoolisme, etc. En tout cas, voici une observation de “ Burning of the feet ” typique où le Bordet Wassermann était positif et qui guérit par un traitement antisyphilitique.

**10.** Deux Localisations rares dans la Syphilis Héritaire Précoce. **Labernadie, V. G. F.,** Major (*Chef du Laboratoire de Pondicherry, Etablissements Français dans l'Indie*).

(i) Arthrito teniporo-maxillaire unilatérale chez un heredo syphilitique âgé de 7 ans, guérie par le bismuth en injection intra musculaire.

(ii) Spina-ventosa chez un heredo-syphilitique de quinze jours.

**11.** Epitmiology of Infantile Biliary Cirrhosis of the Liver. **Mukerji, S. K.,** M.B. (*Calcutta*).

*Geographical Distribution:*—The two principal foci are Bengal and Madras. In Bengal the disease is prevalent only in Calcutta and the towns of the neighbouring districts. In Madras it is found in Madras Town, Arcot, Salem, Trichinopoly, Madura, Ramnad, Coimbatore, S. Canara, and Malabar districts and southern districts of Mysore.

No cases have been reported from Assam and the geographical distribution does not seem to follow that of Kala-Azar.

Infantile Biliary Cirrhosis is not found in any place at a higher level than 1,000 feet above sea level.

*Seasonal Incidence:*—There is no particular seasonal incidence for the disease.

*Influence of Temperature and Humidity:*—

*Races and Religions:*—Analysis of cases shows a relative predominance of the disease amongst the better class Hindus.

In Madras it is common among Tamil children. Cases are also reported from Malabar; but it is not seen in the Telegu speaking districts.

*Influence of Diet of Parents and Children:*—In Madras the disease is most prevalent among the children of the non-fish eating higher classes. But in Bengal everyone takes fish more or less, but still the disease is common here among the children of the middle class Hindus.

Consideration of food given to infants in Bengal and Madras.

*Age Incidence:*—It is prevalent only among infants. Incidence of the disease according to age has been studied under this heading.

**Sex:**—Infantile Biliary Cirrhosis seems to be more common among boys.

**Infectiousness:**—It is not a site, house or family infection.

**12.** Disseminated Sclerosis in India. **Sprawson, C. A.**, Lt.-Col., C.I.E., F.R.C.P., I.M.S.

The disease known in Europe as disseminated or multiple sclerosis either does not exist amongst Indians in India or is at least extremely rare. The author after considerable clinical experience in India and in Mesopotamia has not seen an admitted case in an Indian. The reasons for this statement and its significance are discussed.

**13.** Diabetes in the East. **Stott, H.**, Major, M.D., M.R.C.P., D.P.H., I.M.S. (*Medical College, Lucknow*). (For abstract see p. 25).

**14.** The Incidence and Significance of Certain Clinical Signs in Cholera. **Tomb, J. W.**, O.B.E., M.A., M.D., D.P.H. (*Medical Officer of Health, Asansol Mines Board of Health*).

Intestinal cramps, vomiting antecedent to purging. Blood-stained Stools. Conclusions.

## SURGERY.

**15.** A Consideration of Surgical Complications of Chronic and Latent Amœbiasis. **Chatterjee, K. K.**, Major, I.M.S. (*Calcutta*).

**16.** Facts bearing on the Surgical Pathology of Filariasis. **Chatterjee, K. K.**, Major, I.M.S. (*Calcutta*).

**17.** The Surgical Aspects of Filariasis. **Connor, Sir Frank P.**, Kt., D.S.O., F.R.C.S. (*Professor of Surgery, Medical College, and Surgeon to the College Hospital, Calcutta*).

(i) The magnitude of the Filariasis problem.

(ii) Unsatisfactory state of the pathology of the subject.

(iii) The surgical aspects of the disease.

(iv) Problems of treatment: (a) General. (b) Local and operative.

**18.** The Choice of Operation for Vesical Calculus. **Hooton, A.**, Major-General, C.I.E., I.M.S., K.H.P.

Vesical Calculus is, of course, a very common disease in some parts of India. Many Indian surgeons have had unrivalled experience of the various operations for it which have, at one time or another, held sway, and much has been written with regard to them. Although the operation of litholapaxy was first put on a sound working basis by an American surgeon, several members of the Indian Medical Service have been responsible for modifications in it, and more especially for its adaptation and extension to children. Long series of cases have been published, and the results quoted have been so satisfactory that in India litholapaxy has been considered thoroughly established for many years past as the procedure of election in all but a very few exceptional cases, and if it had not been for a comparatively recent change

in teaching and practice with regard to stone surgery outside India, the subject might have been dismissed as too trite for discussion at this Congress.

For a considerable period there appears to have been a gradual tendency to substitute suprapubic lithotomy for litholapaxy, both in Europe and America, and in a well known text-book published as far back as 1914 it is even stated that "litholapaxy is not now in general use." This may be an extreme view, but there is abundant evidence to show that the cutting operation is being extended at the expense of crushing, and it is now not uncommon to come across junior surgeons, even in India, who, on account of the present trend of teaching at the British medical schools, are reluctant to take up litholapaxy. This teaching is diametrically opposed to the experience and practice of the leading stone surgeons in India, and no apology therefore seems to be needed in bringing the question to the notice of the first Congress of the Far Eastern Association of Tropical Medicine to meet in India.

The present paper sets out to combat this tendency. Surgeons with special experience of Vesical Calculus have furnished large series of cases, and expressed their opinion with regard to the relative merits of the several operations, and it is hoped that others will contribute to a discussion on the subject. Indian surgeons may, of course, continue to work on the lines which they and their predecessors, by virtue of long experience, have found to be most successful, irrespective of the practice in other countries where the disease is not so prevalent, but all the European and many of the Indian practitioners who will be working in this country in the future will be trained in England, and it is essential that their ideas on such an important Indian speciality as vesical surgery should be sound. If the present teaching in England and America is of a retrograde character, as most of us contend, it is very desirable that the arguments in favour of litholapaxy should be authoritatively stated, and a full discussion of the question at this Congress would be of great value at the present juncture.

**19. Some Observations on the Surgery of the Tropical Diseases.**  
**Dr. Maitra, D. N.** (*Calcutta*).

**20. The Relief by Surgery of Endemic Ascites.** **Nigam, K.,**  
Capt., M.D., F.R.C.S. (Eng.), D.T.M. (Lond.), I.M.S. (*Lecturer of Surgery, Medical College, Lucknow*).

*Preface.*—Doubtless there is in the tropics a definite disease—Endemic Ascites—a distinct clinical and pathological entity, characterised by collection of free fluid in the peritoneal cavity progressive emaciation, lingering course and ultimately death ends the scene in the great majority of cases. This type of Ascites is quite distinct from the other types of Acute infective or chronic inflammatory types, e.g. Tuberculosis Peritonitis, or that due to parasites like Hydatid cysts, or that due to portal circulatory obstruction, or that due to Malignant disease of the peritoneum or its contents. This Endemic Ascites is found all over India.

The disease affects both sexes, of any age, caste or profession, though relatively more males present themselves for treatment (common Indian characteristic), most common age being between 30

and 45 years. No particular occupation pre-disposes; there appears a suggestion that this disease affects mostly the people who live in areas where there is faecal contamination of the water supply. The agricultural labourer and the cooly class is mainly encountered in the hospital practice more afflicted with this disease, though persons belonging to the upper class of society have been known to suffer. Husband and wife living together simultaneously in one instance suffered from this condition and died one after the other within three years time, while the younger generation staying with them remained unaffected.

Conflicting views are held regarding its primary cause.

(i) Slow fibrosis of the peritoneum due to an unknown factor X. This factor X may be a Toxin circulating in the blood or else an organism too elusive to control in cultures. Col. C. A. Sprawson designates this disease in a realistic way as chronic Superior Peritonitis.

(ii) It is Chronic Bacillary (Dysenteric) Peritonitis of Col. J. W. D. Megaw, C.I.E., K.H.P., I.M.S.

(iii) It is Tuberculosis Peritonitis.

(iv) Sub-infection from the Bowel.

(v) It is Perihepatitis and perisplenitis.

N.B.—(*Discussion of these various views will be amplified in the complete paper to be communicated later*).

Most of the cases that came to me for surgical treatment gave History of gastro-intestinal disorder of varying intensity preceding the onset of Ascites. This disorder may be of the nature of Diarrhoea, Dysentery, constipation, or simple colic in the lower part of the abdomen. Out of the 20 cases encountered in surgical practice 5 gave definite history of Dysentery, 5 constipation, 4 slight febrile disorder just before they became conscious of swelling of the abdomen, 2 gave history of indefinite diarrhoea, and the rest stated they noticed the swelling of the abdomen the first abnormality; and departure from health started from that. Moreover Bacillary dysentery in India is very common and in mild cases the people affected get well without much of treatment. Popular remedy being Bel fruit which is strongly astringent and sour milk. If Dysentery group of bacilli themselves were responsible for the Ascites, we would very frequently expect to see cases of mild peritoneal effusions readily amenable to treatment, while our experience proved definitely without doubt that when effusion into the peritoneal cavity has occurred the disease is practically incurable. After the most serious cases of dysentery of bacillary origin we do not notice any free fluid in the peritoneal sac even though the case may terminate fatally in the end.

The onset, course and termination of a case of Endemic Ascites with the clinical picture of distended abdomen, without much or constant prominence of superficial veins, much thirst and progressive emaciation; refractory to ordinary methods of treatment. The Guinea Pigs I injected intra-peritoneally with the peritoneal fluid or with the blood of the patients remained alive and healthy and even on dissecting them up nothing resembling Endemic Ascites has yet been met with;

all these point to the fact that its ætiology is far from being definitely proved. The factor X has got to be explored yet.

The patients' bodies get depleted of fluids due to the same being poured into the peritoneal cavity with varying degrees of rapidity and there is diminished or little absorption of the same due to deformed and fibrosed synovial membrane. The rational treatment of this particular form of ascites, consists in diminishing the outpouring of the peritoneal fluid and by providing ample drainage of the fluid back to the rest of the bodily tissues.

*Review of the extant methods of surgical relief.*

(i) The Classical Talma Morison. Operation aims mainly at establishing collateral circulation between portal vein capillaries (compressed by cirrhotic Liver). Consequently it does not much help this condition where we want an efficient drainage of the ascetic fluid.

(ii) Moynihan's veno-peritoneal anastomosis also provides insufficient drainage in these cases.

(iii) Fatty tissue of the Femoral (Scarpa's) Triangle dissected up as a pedicled graft with its base fixed at the level of the Superficial Inguinal Ligament, and then fixed up intra-peritoneally through a stab wound in the lower part of the peritoneal cavity. This tissue gets covered by adhesions and is thus soon rendered unfit as a drain.

*Operation now in use:*—I have had the exceptional opportunity of getting all the cases agreeing to surgical treatment for this disease sent to me by the Physicians and Surgeons of the King George's Hospital. Needless for me to say the patients come to me when all other possible treatment has proved futile. The cases are desperate. In these conditions one ventures to cover new ground. Necessity is the mother of invention. Owing to repeated failures by other methods I started the following technique which promises better results and relieves the poor victims of this disease without entailing the undergoing of an ordeal of a severe operation.

*Aims of the operation:*—To diminish secretion by peeling off peritoneum in long strips from the flanks.

To provide free drainage by putting in huge drainage tubes constructed from the Fascia Lata of either thigh of the patient and anchoring them inside the peritoneal cavity.

Short details. Operation is performed in two sittings to avoid too much shock to the already weak individual.

Stage 1. Formation of a Fascial Tube.

(a) Patient put under an anæsthetic. A long twelve inches incision is made along the lateral aspect of the thigh beginning from Anterior Superior Iliac Spine vertically downwards.

(b) Dissect a strip of Fascia Lata at least 12 inches by 2 inches cutting it free from below but keeping it pedicled at the Anterior Superior Spine.

(c) Make a long tube of this Fascia by stitching it on a sterile rubber tube of at least  $\frac{3}{4}$  in. bore as a mould, using chronicised catgut.

(d) Wrap this up in warm moist sponge, and by continuous suture close up the skin incision.

Stage 2. Intra-peritoneal and intra-abdominal operation for establishing drainage.

(a) Open the abdomen in the middle line or through the rectus sheath on one side to the extent of six inches, (the patient is already tapped off 24 to 48 hours before the operation to avoid the bad effects of sudden release of pressure).

(b) Investigate the condition of the viscera.

(c) Peel off the white and thickened peritoneum from the inner aspect of the anterior abdominal wall particularly from the flanks from the deep surface of the transversalis abdominis muscle. The margins of these gaps are stitched up by the fine catgut at one inch intervals to the underlying tissues. No herniation of the muscle occurs and no harmful effect of this denudation of the peritoneum have yet been noticed by me.

(d) The hollow fascial tube which is lying aside wrapped up warm is to be picked up, make a stab wound in the lower part of the anterior abdominal wall undermining it below the skin to insinuate the fascial tube inside the abdomen.

(e) Anchor on the tube to the posterior aspect of the anterior abdominal wall, fixing it widely open. The mouth or inner opening of this tube is stitched up in such a way as to prevent its occlusion by falling in of the sides of the orifice (same thing as we do to the end of the Urethra when constructing a perineal urinary meatus after complete amputation of the Penis for Cancer).

(f) Avoid possibility of future strangulation of the intestine over this band-like tube by stitching the apposing surfaces of the posterior aspect of the anterior abdominal wall and the fascial tube.

(g) Drain the peritoneal cavity for five to six days by a fine (say  $\frac{1}{4}$  in. or less in section) rubber tube stitching it through the lower part of the wound in the abdominal wall. The rest of the wound is then stitched up in layers as usual.

Time taken amounts to about 20 minutes for the above. No severe shock is produced and no immediate or distant mortality due to the operation alone has yet been met with.

This procedure is repeated on the opposite side after a fortnight.

This operation is giving satisfactory results.

## OPHTHALMOLOGY.

21. Glaucoma in Calcutta. **Coppinger, W. V.**, Lt.-Col., I.M.S. (*Calcutta*). (For abstract see p. 26).

22. Ocular Complications in Leprosy. **Kirwan, E. W. O'G.**, Major, I.M.S. (*Superintendent, Campbell Medical School and Hospital*).

23. Glaucoma as a complication of Epidemic Dropsy. **Mukerjee, S. K.**, L.M.S., F.R.C.S. (*Calcutta*).

**24. Ocular Tension.** **Newcomb, C.,** Major, D.M., F.I.C., I.M.S. and **Verdon, P.,** Capt., B.A., B.Ch., M.R.C.S., L.R.C.P., I.M.S. (*Madras*).

The effect of hypertonic saline injections on both the hydro-static and osmotic pressure of the blood and on the ocular tension has been investigated with two objects:—

(i) To test if with Indian patients a raised ocular tension can be lowered in this way as a therapeutic measure without danger.

(ii) To test the theory recently advocated by Duke Elder that the ocular tension is chiefly determined by the balance of hydro-static blood pressure against the difference between the aqueous and blood osmotic pressures.

In a series of cases of glaucoma the blood pressure, the ocular tension, the red blood cell count and the depression of the freezing point, total solids, ash and chlorides of the blood, have been determined, before and after the injection of hypertonic saline.

The conclusions reached are:—

1. Therapeutically the procedure is a valuable one.

2. The osmotic pressure of the blood goes up, and in many cases the ocular tension falls, but it remains to be shown whether the ocular tension is more closely connected with osmotic pressure or with other changes in the constitution of the blood.

## GYNAECOLOGY AND DISEASES OF PREGNANCY.

**25. Some Diseases of Pregnancy in India with special reference to Communities.** **Balfour, Margaret I.**

Introductory remarks regarding the conditions of childbirth in India. An enquiry on maternal mortality in childbirth in India has been carried out during the past 2 years under the auspices of the Indian Research Fund Association. Records of 11,343 cases of labour have been sent up from hospitals in different parts of India by qualified medical men and women. These have been examined and classified.

244 deaths occurred directly due to pregnancy or labour from causes as follows:—

	Deaths.	Per cent.
Anæmia of pregnancy .. ..	87	35.65
Puerperal sepsis .. ..	43	17.62
Eclampsia .. ..	25	10.24
Osteomalacia (its consequences) .. ..	22	9.01
Hæmorrhage .. ..	29	11.88
Other complications of pregnancy and labour .. ..	38	15.57

When these figures are compared with similar figures from other countries it appears in a general way that in India accidents and complications of labour are fewer but the diseases of pregnancy are much more frequent.

(a) *Anæmia of pregnancy* resembles Addison's pernicious anæmia but differs from it in its more sudden onset, its more rapid course and its lack of remissions.

It occurs in all parts of India.

The symptoms usually commence after the middle of pregnancy. Fever is often an initial symptom followed by oedema, swelling, pallor, weakness. In 38 per cent. of a series of 150 cases diarrhoea occurred, in 40 per cent. vomiting, in 31 per cent. sore tongue. 29 per cent. were primiparae. Death occurred in 42 per cent. of the cases most often within 24 hours of delivery but was sometimes delayed many weeks. 53 per cent. of infants were stillborn and another 15 per cent. died a day or two after birth. None showed signs of anaemia.

In the blood picture the red cells were much reduced, the colour index was high. There was rarely leucopenia. Blood platelets were absent or scanty. Anisocytosis was always present, poikilocytosis usually so. Nucleated red cells were present in about half the cases. Post-mortem examinations were rarely possible but in two cases evidences of hæmolytic were found in the liver and spleen and aplastic areas were present in the bone marrow.

(b) *Eclampsia*.—Its incidence varies both as to frequency and severity in different parts of the country.

(c) *Osteomalacia* occurs most frequently in the northern and central parts of India, less frequently in the West and is absent from the South. It is believed to be due to a deficiency of Vitamin D, or lack of sunlight but this does not explain its unequal distribution in parts of India.

*The influence of community*.—In India speaking in a broad sense we have 3 communities of women living side by side, subject to the same climatic and housing conditions, equally exposed to endemic and epidemic diseases but differing as regards certain important particulars namely, diet, literacy, domestic habits and customs relating to marriage and childbirth. These communities are the Hindu, Mahomedan and Christian. Particulars relating to the incidence among them of the chief diseases of pregnancy were obtained by means of a questionnaire sent out and are shown in the following tables.

*Incidence of osteomalacia, eclampsia and anaemia by community in  
Bombay Hospitals.*

Community.	Total number of cases.	Proportion to total births in community	OSTEOMALACIA.		ECLAMPSIA.		ANÆMIA.	
			Number of cases.	Ratio per 1,000 labour cases.	Number of cases.	Ratio per 1,000 labour cases.	Number of cases.	Ratio per 1,000 labour cases.
Hindu ..	2,066	14%	6	2.9	8	3.8	83	40.1
Mahomedan..	842	23%	32	38.0	14	16.6	79	93.8
Other ..	801	44%	nil.	..	3	3.7	39	48.6



*Incidence of osteomalacia, eclampsia and anæmia by community in All-India Hospitals (less Bombay).*

Community.	Total number of cases.	Ratio to total births in community.	OSTEOMALACIA.		ECLAMPSIA.		ANÆMIA.	
			Number of cases.	Ratio per 1,000 labour cases.	Number of cases.	Ratio per 1,000 labour cases.	Number of cases.	Ratio per 1,000 labour cases.
Hindu ..	5,167	..	160	30·9	79	15·2	148	28·6
Mahommedan..	1,273	..	79	62·0	31	24·3	36	36·1
Other ..	1,152	..	6	5·2	8	6·9	15	13·0

It will be seen that both tables show the incidence of all three diseases to be greatest among Mahommedan women and least among women of "other" class who are very largely Christians. Some details follow showing the proportion these cases bear to the number of births in Bombay and the size of the different communities in India.

Facts regarding the different communities which might influence the incidence of the diseases of pregnancy are:—

- (1) Literacy.
- (2) Diet.
- (3) Early marriage.
- (4) Consanguineous marriages.
- (5) Domestic habits.

In conclusion I should like to point out that India should be an ideal country for obstetric research but workers are hampered by the difficulty of getting information from the records of most maternity hospitals. Records are kept in accordance with the requirements of the Local Government for its annual report. All that the Government of Bombay requires is:—

1. The number of normal labour cases.  
The number of deaths.
2. The number of abnormal labour cases.  
The number of deaths.

Some Local Governments do not even require so much.

The numbers of different obstetric operations done have to be filled in, but not the cause which rendered them necessary. Hence these particulars are often not noted down on the hospital case-sheet and much valuable information is lost. The information contained in the Public Health Reports of large towns is also scanty although in some towns many of the deaths in childbirth are certified by medical practitioners. If Local Governments would require information as to the diseases of

pregnancy from aided maternity hospitals and wards, and medical officers of health would enter anæmia of pregnancy and osteomalacia (as a contributory cause) under their death headings much more light would be thrown on the conditions of childbirth in India.

**26.** The Problem of the Child and Maternity and Child Welfare in the United Provinces including causes of Infant Mortality and how to alleviate them. Dr. **Commissariat, S. H.**, F.R.C.S.I., S.M.D., W.M.S. (*United Provinces*).

**27.** A Preliminary Note on the Bacteriological Examination of some Discharges from Cases of Anæmia of Pregnancy, Normal Pregnancy and of Non-Pregnant Cases of Anæmia. **Emanuelov, A.**, M.D. (*St. Petersburg, Russia*) and **Mehta, M. M.**, D.Sc. (*Lond.*). (*From the Haffkine Institute, Bombay*).

The paper gives an account of the principal pathogenic species of *B. welchii* and streptococci isolated from faeces and urine in the above conditions.

1. Their method of separation.
2. Cultural reactions.
3. Preparation of toxin.
4. Animal reactions (toxicity and influence on elements of the blood).
5. Conclusions.

**28.** Pathogenese der ulcus tropicum der vulva und siene folgesuntunde. Dr. **Joachimovits, R.** (*From the Surgical Department of the C. B. Z. in Soerabaya: Professor Dr. Leesk*).

In Java the author has observed a typical state of illness in Dutch-East-India little known till now and quite unknown in its ætiology. It is rather frequent but seems to vacillate according to regions. (In Singapore and its environs it seems to be less frequent as I was told.) 17 cases have been observed totally. The illness shows itself in a slow destruction of the stricken parts of the exterior genitals beginning with an ulcer at the inner side of the labia covered with mucous membrane especially at the clitoris or its environs or at the fossa navicularis. This ulcer probably is an ulcer molle, but any other lesion there can form the entrance to the following infection. The illness is destructing gradually large parts of the exterior genitals, but it seems to spare the mucous membrane of the vagina, to a certain degree and to spread more deeply at its limits or transition places in another epithelium, so that it apparently undermines the vagina. It seems that the bacillus, be is one or more of them, prefers the connective tissue. If the process continues—without intervention of a physician as it occurs so frequently—the bacillus corrodes the whole urethra, the sphincter urethræ and it comes to incontinence. Then the illness heals with scars, at least greater part of it. The healing process takes place with a strong shrivelling of the connective tissue, so that now the hole and its environs often take the form of a fish-mouth (Boerma). But it can also be—a kind of natural healing trial—that the lumen of the urethra diminishes to such an extent, that the urine can only flow out in drops. Coming from the fossa

navicularis the process proceeds to the recto-vaginal septum generally and the pararectal tissue, and its results are recto-vaginal fistulæ, which open frequently *before* the fossa navicularis or in it—when the vagina has come loose from it. The process is often combined with deeply sitting strictures of the rectum. The initial ulcer is very frequently an *ulcus molle* with all signs of it as one can recognize at the effects (fringed labia a.s.o.), but the bacillus Ducrey is not able to effect this state of illness mentioned above; there must be also a new bacillus, which can be already supposed by the change of the form of the initial *ulcus molle* out of purely clinical reasons. The ulcer, which had first undermined borders and uneven ground becomes even-bordered and its surface gets even, the suppuration diminishes. By means of repeated trials the author could find spirochætes and bacilli fusiformi in the stream—and histological preparation. Thus it seems proved that the cause of the illness described is an *ulcus tropicum*, the typical localisation of which being in the inner part of the shank, is no general localisation as had been supposed, but the *ulcus tropicum* can also have its seat at the vulva and do the above-mentioned destructions. The two cases of fresh *ulcera tropica* at the vulva and at male genitals published by Pattiradjawane prove that an *ulcus tropicum* can occur at the mentioned—more rare—localisation. The same cases prove that it is not necessary that an *ulcus molle* must needs precede to allow the spreading of the *ulcus tropicum* in the genitals.

## DERMATOLOGY.

**29.** My Experience of Dermatology in the Tropics. Dr. Gupta, A., M.B. (*Calcutta*).

(i) A brief survey of the field of Dermatology in the Tropics.

(ii) In what ways factors like tropical heat, sun light, habits of the people, etc., influence the character and incidence of certain skin affections in the tropics.

(iii) Dermatological clinic in the West and in the Tropics—a comparison.

(iv) Some remarks about certain skin affections commonly met with in the tropics.

(v) Affections which appear to be new and do not exist in Dermatological literature.

(vi) Medical profession and the present state of Dermatology in Bengal; some peculiar notions about Dermatology: 'W. R.' as the misleading factor: auto-vaccine craze, etc.

(vii) Need for proper teaching.

## PATHOLOGY.

**30.** See *ante* abstract No. 13.

## MENTAL HYGIENE AND PSYCHIATRY.

**31. Mental Hygiene for Europeans in the Tropics. Berkeley-Hill, O., Lt.-Col., I.M.S. (Medical Superintendent, Ranchi European Mental Hospital).**

The rise and development of Mental Hygiene. The term first employed in America. The formation in 1916 of the American National Committee for Mental Hygiene. Quarterly Journal of the Committee, entitled, "Mental Hygiene," first published in 1917. In 1920, France follows the example of America and founds La Ligue d'Hygiène Mentale. In 1923, England founded the National Council for Mental Hygiene. During the war similar organisations came into being in Germany. The objects and aims of these organisations are practically the same, namely, (1) To secure good mental endowment, (2) To promote good development of mental capacities, (3) To promote a good use of the mental endowment, (4) To study the factors and conditions that are favourable to a good use of mental endowment. Then, as promotion of the good involves prevention of the harmful, mental hygiene must also consider, (1) The nature of those factors and conditions which hinder or impair those desiderata, as well as, (2) ways of preventing such factors and conditions. Further, mental hygiene must consider, (3) The effects of harmful influences, and (4) ways of restoring impaired functions, if possible to their original state of efficiency, and (5) ways of helping the handicapped individual to compensate for the impairment. Finally, mental hygiene must include the care of the handicapped in order that the environment may be as positively favourable as possible. Although it must be admitted, many of these considerations belong to the domain of psychiatry, mental hygiene cannot ignore them.

There is at present no mental side to Tropical Hygiene. Hitherto the subject of mental hygiene has met with little attention in tropical countries. Books on tropical diseases hardly mention mental disorders. There are two books which contain short references to mental disorders peculiar to tropical countries: Schaub's "Krankheiten der Warmen Lander," and Mense's "Tropen Krankheiten." In 1926, the Bishop of Singapore wrote to the British Medical Journal asking to be informed what is the cause of the upset of mental balance which is so common among Europeans in the tropics. To the Bishop's enquiry the British Medical Journal published eight replies from various doctors. The amazing diversity of opinion expressed in these letters only tend to show how ignorant we are about mental disorder, especially of the neurosis, which beset Europeans resident in hot countries. Early this year Lt.-Col. H. W. Acton, of the Calcutta School of Tropical Medicine, delivered before the Bengal branch of the Asiatic Society, a lecture entitled "Neurasthenia in the Tropics." These examples practically constitute all that has been published about psychopathic disorder among Europeans in tropical countries, views of lay writers, novelists, etc. The principal mental disorder amongst Europeans in the tropics is probably an anxiety neurosis. The reasons for this: How the conditions of life of many Europeans in tropical countries favour the development

of an anxiety neurosis. The treatment and prevention of anxiety neurosis. Other types of mental disorder. Tropical Mental Hygiene. What the French have done and are doing in the tropical colonies of France. What other European countries with interests in the tropics might do. What has been so far done in India. What might and should be done.

**32.** The Rôle of Indian Hemp in causation of Insanities in India. **Dhunjibhoy, J. E.**, Capt. M.B., B.S., I.M.S. (*Kanke, Ranchi*). For abstract see p. 128).

**33.** The Mental Factor in Disease. **Nunan, W.**, B.A., M.D. (*Police Surgeon of Bombay: Professor of Medical Jurisprudence and Toxicology*).

An account of some cases cured by suggestion.

**34.** Report on a Case of Communicated Insanity. **Parasuram, G. R.**, B. A., L.M. & S., M.R.C.P. (I.), Dipl. Psych. (Edin.). (*Civil Assistant Surgeon, Government Mental Hospital, Madras*).

Records a case where the active agent a case of Paranoia of the exalted type caused delusions in the case of his brother and three women of his family. The delusions were of a religious character. The brother was also admitted as a certified case.

## RADIOLOGY.

**35.** On the Radiological appearances found in certain Tropical Diseases. Dr. **Galstaun, S. G.**, D.M.R.E. (*Calcutta*).

**36.** Utilité des examens radioscopiques repelés au cours des affections Cardio-Vasculaires des Beriberiques. Dr. **Jourdan, E. E. M.** (*Directeur-Local de la Santé du Tonkin, Hanoi, Indo-Chine*).

**37.** The Results of Radium Treatment in Uterine Fibroids and Metropathia Hæmorrhagica in Bengal. **Mitra, S.**, M.D. (Berlin), M.B. (Cal.), F.R.C.S. (Eng.). (*Medical Officer in Charge, Chittaranjan Seva Sadan Women's Hospital*).

Observations have been made upon 52 cases of uterine fibroids and metropathia hæmorrhagica, of which 32 cases are fibroids and the remainder having only the symptom of hæmorrhage without any enlargement of the uterus. Amongst the fibroid tumours most of them are interstitial in character giving the best possible results with radium. 4 cases are subperitoneal fibroids; their size has become reduced after the application of radium. 2 cases of fibroids had cervical polyps which were removed before radium was applied. In almost all cases of metropathia hæmorrhagica the bleeding was stopped. Our technique is a little different from that of other clinics. We always make an intra-uterine application. We generally give 2,400 m.g. hours' exposure in 2 sittings. If necessary a second series is given after 6 weeks.

The so-called contra-indications of radium treatment in fibroids have been reduced to a minimum by careful preliminary treatment and

improved technique; and it is our firm belief that in cases of uterine fibroids and metropathia hæmorrhagica, radiotherapy will be the treatment of choice, excepting only a very small percentage of cases where surgical intervention will be necessary.

## DENTISTRY.

• **38.** The Habit of Pan-Chewing in its Relation to the Prevalence of Pyorrhœa Alveolaris in India. **Ahmed, R., D.D.S. (Calcutta).**

The etiology of pyorrhœa may be divided into two main headings :— (a) local and (b) systemic. It is not the purpose of this paper to discuss in detail all the causes that lead to pyorrhœa alveolaris. We shall, in this paper, try to show the rôle the habit of pan-chewing plays in causing both local and systemic effects leading on to pyorrhœa in those addicted to it.

The teeth and jaws of the people of India are from the point of view of structure, form and arrangement comparatively much more perfect than the teeth and jaws of the modern Europeans and Americans. All observers are agreed on the point that dental caries is the scourge of the Occident, while pyorrhœa alveolaris is the scourge of the Orient. There are various opinions as to why this is so. Some say that the periodontal membrane of the people of India is inherently deficient. Some opine that the people being vegetarians, their teeth lack the exercise needed for the proper development of the periodontal membrane and hence are susceptible to pyorrhœa. All these views are open to question and it is not the purpose of this paper to discuss them. But there is no doubt that the habit of pan-chewing does influence the formation of calculus around the gum-margin and on the roots of the teeth. These facts are clinically verifiable. Although complete statistics are not available just now, all observers are agreed that pyorrhœa alveolaris is almost universal amongst the Indian people above thirty-five years of age. The writer examined recently off-hand in sequence without making any choice one hundred patients and kept records. It was found that 78 out of the hundred had pyorrhœa in some stage or other. So it can be readily seen how prevalent this disease is amongst all Indians.

Pyorrhœa alveolaris is a disease of the periodontal membrane. In this connection it is advisable to remember that the alveolar process is nothing more than the thinned out edges of the maxillary bone and their bony offshoots. The socket is an enlarged medullary space and is made up of the above described bony offshoots, which constitute the alveolar process. Bundles of ligament fibres run from the wall of the bony offshoots of the alveolar process and maxillary bone are embedded deeply into the cementum of the root, forming a circular ligament which keeps the tooth suspended in the alveolar cavity. Between these bundles of ligaments there are spaces filled with loose cellular tissues (medullary spaces) which communicate with other similar medullary spaces of the maxilla and alveolar process. The disease begins with an inflammatory process of the gum-margin at the gingival space, it destroys the epithelial tissue and gradually involves the bones, which later become necrotic. New bone formation take place and results in

partial encapsulation. It is the involvement of the bony socket which is considered by almost all the observers to be the characteristic feature of this disease. When left unattended the osteitis of the bony socket leads to pus formation and in course of time is gradually destroyed and excreted as pus, the teeth eventually being extruded as a foreign body.

As has been said before, the causes of pyorrhœa are many. As far as India is concerned, one of the reasons why it is so prevalent here is because of the prevalent custom of pan-chewing. Almost all educated Indians, who are addicted to this habit are emphatically of the opinion that as pan consists of an astringent leaf, some carminatives, deodorants and an alkali it is positively beneficial to the digestion and its regular use conduces to good health. That such a view is absolutely unfounded may be proved from the fact that the habitual pan-chewer is a dyspeptic at the age of thirty at the most, he invariably suffers from pyorrhœa alveolaris and its attendant sequel. I have handled thousands of cases where I have seen and been convinced of the baneful effects of this prevalent habit and I feel it a duty to sound a note of warning to my countrymen as well as to all medical men practising in India. The only good points in favour of pan are that it is a good antacid, and deodorant and its use makes the use of the lip-stick superfluous for Indian ladies. But its merits are outnumbered by its demerits. Pan consists of an astringent leaf on which is placed a smear of catechu, a pinch of slaked lime and lastly a few bits of betelnut and spices. The whole is enclosed within the leaf, placed in the mouth and chewed, generally after meals. This becomes a habit like smoking and grows until some people consume a hundred or two a day. The result is that the pan-chewer is constantly stimulating his salivary glands to action when there is nothing in the mouth to act upon. This involves an enormous waste of saliva, which is expectorated instead of being utilized to fulfil its natural function as a solvent of starch. The fibres of the leaf and betelnut get packed in between the teeth and each time still more is packed, until gradually the festoons of the gum between the teeth are forced lower and lower. This leads to the formation of pockets in between the teeth where the remnants of the betelnut and pan lodge and stay hours and days at a time. This constant irritation of the gum leads on to an inflammation of the gum-margin which in course of time leads on to the formation of pus and destruction of the alveolar process. Some people who use pan also use a preparation called "Zarda," which is an aromatic preparation of tobacco and this tobacco preparation is highly irritating to the soft tissues of the mouth. Some who use pan and Zarda constantly do not feel much taste in their food and they can live for days without any other food except pan. The lime in the pan is swallowed with the remnants of the leaf and in a few months we have great excess of lime in the system which comes up in solution in the saliva and is deposited on the teeth as calculus in large quantities. The blood stream gets charged with excess of lime and this is brought to the teeth in the serum as serumal tartar. There is no doubt that this surcharging of the system with lime changes the condition of the saliva. Analysis of salivary calculus shows it to be composed of about 22 per

cent. of water and organic matter and about 78 per cent. of inorganic matter. Dr. Black has established that over-eating creates an excess of globulin or globulins in the blood which when in-variable over accumulation are thrown out with secretion or excretion, probably in combination with calcium salts as spherules of calco-globulin which in the mouth deposit first as a soft mass and then harden by decomposition of colloid elements. He is of the opinion that serumal deposits have a similar origin. It seems reasonable, therefore, to conclude that the habitual pan-chewer due to his taking excessive amount of lime in the system gets his blood stream charged with excess of lime and this is deposited on the teeth as serumal tartar.

The constant irritation from the pan, the pan fibres which lodge in between the teeth and the serumal calculus which is deposited on the roots of the teeth all lead to the destruction of the peridental membrane interposed between the root of the tooth and its socket. In course of time pus is formed and this pus slowly dissolves the bony wall of the socket. Till at last a time comes when the tooth loses all its support and is thrown out by nature as a foreign body. The point that concerns us is the fact that pan-chewing acts as a factor of great importance in causing the irritation of the peridental membrane and finally leads to its destruction. The fact that pyorrhœa is more prevalent in India than in other parts of the world is due to this particular habit of the people. It can safely be said that fully 90 per cent. of the people of India chew pan. Some take a hundred or two a day, while others take ten or fifteen a day. It is almost a universal custom.

Those that have observed closely must have been struck at the devastations that pan makes on the soft tissues of the mouth. The teeth are discoloured an ugly red, the necks of the teeth are completely covered with salivary tartar. The gums are pushed down. The peridental membrane and the alveolar process are destroyed. (*See Exhibit.*) The teeth sit in a bed of pus, part of which is swallowed and part absorbed by the lymphatics. It is the consensus of opinion of all the dentists practising in India that pan-chewing is one of the most fruitful sources of pyorrhœa alveolaris. Nearly 70 to 80 per cent. of the adult population of India suffer from pyorrhœa. A great improvement could be made in the situation if every dentist and medical practitioner in the land enlisted in the campaign against the use of pan. Some will say this is a super-human task and consequently impossible. All important and worthwhile reforms are difficult; but that is no reason why we as a profession should not raise our voice against a custom which we definitely know to be deleterious to the human system. Be the custom, ever so ingrained, still we shall and ought to try to reform or partly remedy this habit amongst our people. I have consistently waged a war against pan-chewing and I can say that it has borne some fruit. Some families have entirely given up pan-chewing; others have greatly diminished the consumption. If every dental and medical practitioner in the land were to preach against the use of pan and show their patients how very harmful and objectionable the practice is, there would be less of pyorrhœa in the land.



This reform in the habit of the people is very essentially necessary in order to raise the vitality and resistance to disease of the people of India. Cases of cancer of the tongue or cheeks are quite common from the over-use of pan. Dyspepsia and diarrhoea are the common sequel. The various other systemic diseases all lead from or are helped by the pyorrhoea which is the direct result of pan-chewing.

The dental and medical practitioners of India would be rendering an inestimable boon to the people if they can even modify to a certain extent this extremely prevalent bad habit which is certainly lowering the vitality of the people. It is also a very unæsthetic habit and stains the teeth and the mouth a dirty red and makes an unfavourable impression on others. Taking a long view of the matter, it would not be far-fetched to say that the high mortality rate of India may be traceable to the extreme prevalence of pyorrhoea, which is undoubtedly due to the custom of pan-chewing. It is up to the dental and medical profession in India to help in the eradication or even modification of this vicious custom, which is ruining the health of the people of the land.

**39.** Some Observations on Pan-Supari Chewing—Use of Baval and Nijn Sticks as a Tooth Brush—and Tooth Pastes. **Modi, J. J.,** Dr., I.D.S. (*Dental Surgeon, Bombay*). (For abstract see p. 129).

**40.** Oral Sepsis. **Taylor, H. A.,** I.D.S. (*Calcutta*).

## STATE MEDICINE AND HYGIENE.

**41.** A Statistical Enquiry into School Myopia. **Bannerji, J.,** M.B. (*Public Health Department, Bengal*).

This is a statistical enquiry into the state of vision of Indian students in Calcutta, specially with reference to prevalence of Myopia at different ages and investigation of the factors supposed to influence the progress of Myopia.

The enquiry is the result of examination of the state of vision of the students numbering totally 1,354 distributed in the following educational institutions of Calcutta.

The Sanskrit College.

The Sanskrit Collegiate School.

The St. Paul's College.

The St. Paul's Collegiate School.

The Bethune College.

The Bethune Collegiate School.

The Calcutta Madrasa (Anglo-Persian Department). Table I shows the number of students examined in each institution and the state of vision of students in each with the kinds of defects found and put in different columns. It will be seen from the said Table that out of 1,354 students examined 1,064 or 78 per cent. had errors of refraction. Out of the total number 501 or 37 per cent. had hyper-metropia and 74 or 5 per cent. had hyper-metropic astigmatism. Myopes and myopic astigmatics taken together numbered 437 or formed 32 per cent. of the

TABLE I.

*Total number of students examined for sight-testing in each educational institution visited with the number of different types of defective vision found.*

Institutions.	Total number examined.	Number of hypermetropes.	Number of myopes.	Number of myopic astigmatics.	Number of hypermetropic astigmatics.	Number of mixed astigmatics.	Sufferers from organic eye-diseases and amblyopes.
The Sanskrit College	223	77	68	18	6	1	5
St. Paul's School	163	85	19	9	8	0	7
Sanskrit Collegiate School	160	51	37	21	13	1	4
St. Paul's College	203	104	57	15	5	0	7
Bethune College	96	20	34	15	5	0	2
Bethune Collegiate School	182	70	30	9	12	0	8
Calcutta Madrassa (Anglo-Persian Department)	327	94	62	43	23	1	16
TOTAL	1,351	501	307	130	74	3	49

TABLE II.

*Showing the total number of students of particular ages examined in different educational institutions of Calcutta and the number of myopes amongst each age-group with percentages.*

Ages.	Number of students examined.	Number of myopes found with percentages.	
5 to 7	23	2	or 8.7%
8 to 9	81	10	or 12.3%
10 to 11	166	34	or 20.4%
12 to 13	183	58	or 31.6%
14 to 15	156	46	or 29.5%
16 to 17	238	80	or 36.17%
18	112	34	or 30.3%
19	136	47	or 34.5%
20	111	52	or 46.8%
21	54	35	or 64.8%
22	41	17	or 41.4%
23	30	12	or 40%
24	18	4	or 22.4%
25 and above	5	0	or 0%
TOTAL	1,354	437	or 32%

total number. There were only three cases of mixed astigmatics or 0.2 per cent. of the total. There were 49 cases of amblyopes and sufferers from organic eye diseases, hampering vision which made up 3.5 per cent. of the total.

In Table II is given the prevalence of myopia at different ages among each group of students of particular ages examined in the various Educational Institutions of Calcutta. From this Table it will be seen that myopes increase in number with advance in years of ages from 5 to 21 and then again diminish.

**42.** De-Ratting of Ships. Dr. **Crow** (*Port Health Officer, Rangoon*). (For abstract see p. 135).

**43.** Incidence of Pulmonary Tuberculosis in Multan City, according to Sex, Religion, Age, Occupation and Residence in Different Parts of the City. Dr. **Gian Singh**, M.B., B.S., D.P.H. (*Medical Officer of Health, Multan*).

(1) Sex and Religion:—An analysis of deaths from pulmonary tuberculosis in Multan, a town in the Punjab with a population of 90,000 for a period of ten years shows that the average death-rate from pulmonary tuberculosis:—

- (a) For the whole town is 1.87 per thousand of the population.
- (b) For Hindu males is 1.05 per thousand of the Hindu Males.
- (c) For Hindu females is 2.81 per thousand of the Hindu Females.
- (d) For Muhammadan Males is 1.20.
- (e) For Muhammadan Females is 2.77.

From these facts it is evident that:—

- (i) Females both Hindu and Muhammadan, fall victims to tuberculosis nearly  $2\frac{1}{2}$  times more than the males.
- (ii) Muhammadan males are affected with the disease slightly more than the Hindu males and Hindu females show higher incidence of pulmonary tuberculosis than Muhammadan females.

Causes: (a) Bad economic and housing conditions.  
 (b) Child marriages.  
 (c) Want of proper nursing of females at the birth of a child.  
 (d) Custom of Purdah.

Higher incidence of tuberculosis among Muhammadan males as compared with Hindu males is due to their comparative poverty and following certain occupations which predispose to tuberculosis.

Higher mortality from tuberculosis among Hindu females as compared with Muhammadan females is due to their living in the central congested parts of the city.

(2) Age:—

- (a) Up to 10 years of age males and females of both the communities succumb to the disease almost equally.
- (b) Mortality in females rises abruptly after the age of 10 years.—Child marriage and Purdah.

- (c) Females show the maximum mortality from the disease between the ages of 10 and 30 while in the males the maximum mortality begins and ends 5 years later.
- (d) Up to 30 years of age Hindu females die from the disease more than the Muhammadan females but after 30 years of age reverse is the case. Similar observation holds good for Hindu and Muhammadan males.
- (e) After 45 years of age mortality from the disease falls abruptly more in the females than in the males.
- (3) Occupation:—Deaths from Pulmonary Tuberculosis among:

## (Hindu Males)

(a) Shopkeepers	46 per cent.
Servants (Govt. and Private)	21 per cent.
Labourers	7.33 per cent.
Priests	6.80 per cent.

## (Hindu Females)

(b) Wives of Shopkeepers	57.49 per cent.
Wives of Servants (Govt. and Private)	22.22 per cent.
Wives of Servants (Govt. and Private)	22.22 per cent.
Wives of Labourers	6.71 per cent.
Wives of Priests	3.70 per cent.

## (Muhammadan Males)

(c) Weavers	15.40 per cent.
Servants (Govt. and Private)	11.83 per cent.
Shopkeepers	10.98 per cent.
Shoemakers	9.85 per cent.
Carpenters	8.73 per cent.
Labourers	7.33 per cent.
Tailors	7.04 per cent.
Agriculturists	3.94 per cent.

## (Muhammadan Females)

(d) Wives of Shopkeepers	15.45 per cent.
Wives of Weavers	14.70 per cent.
Wives of Servants (Govt. and Private)	14.40 per cent.
Wives of Labourers	8.76 per cent.
Wives of Shoemakers	7.72 per cent.
Wives of Carpenters	7.43 per cent.
Wives of Agriculturists	4.16 per cent.
Wives of Tailors	4.14 per cent.

Thus:—

- (a) Shopkeepers of both the communities show a high mortality from the disease.
- (b) Men of both the communities whose means of subsistence in service fall victims to the disease in fairly high numbers.

(c) Professions of weaving, shoemaking, carpentry and tailoring are harmful for lungs.

(d) Occupations of the males of both the communities re-act upon their females, as far as tuberculosis is concerned.

(4) Residence in different parts of the City:—

Population of the town inside the city is 43 per cent. and outside the city 57 per cent. but, deaths from tuberculosis are 53 per cent. inside the city and 47 per cent. outside.

*Conclusion*:—To decrease mortality from tuberculosis in cities like Multan, in addition to well recognised anti-tuberculosis measures:—

(i) Government should oblige Municipalities:—

(a) To take housing schemes in hand.

(b) To open up the congested areas.

(c) To enforce building by-laws prohibiting high houses in narrow lanes.

(ii) Municipalities should employ Health Visitors to carry on propaganda among the women against certain customs observed by them during their puerperal period.

(iii) People themselves should form anti-purdah and anti-child marriage societies.

(iv) Working and economic conditions of low paid Government servants should be improved by Government.

(v) Propaganda should be carried on among the Shopkeepers to improve their working conditions.

**44.** Tropical Diseases of Northern Manchuria. Dr. **Ginzton, L.** (*Chief Medical Officer of Health, Chinese Eastern Railway Administration, Harbin, China*).

The geographical position of the Northern Manchuria, being the thoroughfare from the Southern China and the Vast Northern Provinces of China and Great Siberia is very favourable for the spread of all kinds of contagious diseases.

The thickness of the population of the Southern China and the possibilities of colonisation of the vast unoccupied fertile lands of Northern Manchuria causes constant emigration of Chinese agricultural elements and thus aids the spread of tropical epidemical diseases.

Climatic conditions of the Northern Manchuria in general are healthy and unfavourable for the spread of the tropical diseases.

The history of all the tropical diseases in Northern Manchuria such as cholera, plague and malaria shows that their appearance in Northern Manchuria was always connected with intensity of these epidemics in the tropics, and that as soon as these diseases showed the tendency to decline there the tropical epidemics in the Northern Manchuria either diminished or ceased.

The periods of the appearance of tropical disease in Northern Manchuria are strictly regular and their incidence and mortality are not identical.

The anti-epidemic preventive measure of the Chinese Eastern Railway and the North Manchuria Plague Prevention Service to a greater extent are checking the spread of the tropical diseases in Northern

Manchuria and thus these Sanitary Organisations serve as barriers against the penetration of these diseases further West.

To insure the more effective control of the spread of tropical diseases and their penetration to the Western Europe it is necessary to extend the Sanitary preventive measures to the Chinese thickly populated cities, by establishing there health departments with requisite numbers of sanitary officers of health.

**45.** The International Aspect of Disease with special reference to Quarantine. **Graham, J. D.**, Col., C.I.R.; I.M.S. (*Public Health Commissioner with the Government of India*). (For abstract see p. 139).

**46.** Experimental Studies on the Entrance Path of the Smallpox Virus. **Dr. Nakamura, Y.** (*Professor, Hokkaido Imperial University, Sapporo, Hokkaido, Japan*).

**47.** A Health Campaign among 7,000 Tea Garden Coolies. **Leitch, J. N.**, M.B., B.S., Lond., M.R.C.S., L.R.C.P. (*Assam*).

An attempt has been made to evaluate the various factors in disease prevention, as experienced in a health campaign extending over some three years, and involving about 7,000 tea garden coolies.

The initial difficulties were threefold. Firstly, the hospital records had not been kept on any system, so that no useful information could be obtained from them. Statistics were incomplete and misleading.

Secondly, different methods prevailed on different gardens, involving all dealings with disease and sanitation. These led to confusion and there was no basis on which results could be compared.

Thirdly, there was no standard of comparison, such as normal weight, height, and general physical measurements, as European tables are not applicable to such a population.

An attempt was made to overcome these difficulties. The sick registers were revised, and a nomenclature of diseases insisted on. A monthly health return form was adopted and has since been in regular use. A medical history sheet was elaborated to record all points of importance in logical order and eliminate the personal element as far as possible. A scheme of standard treatments was drawn up, the principles of which were insisted on, so as to compare the results obtained.

By special parades extending over some three months, the whole population underwent a thorough physical examination, the results of which are recorded and classified. Treatment followed where necessary. A temporary laboratory was fixed up to help with the pathological work involved. Each illness has since been entered on to the patient's history sheet.

Attention was then directed to buildings and sanitation. The lines in which the coolies lived were in some cases irregular, difficult to drain, and dilapidated. Water-supply was crude and there was no means to prevent pollution. Sanitary measures consisted in a clean-up once a year only. Latrines scarcely existed and faecal infection of the soil was heavy. These points are illustrated by lantern slides, and show the reconstruction which is now going on to remedy them.

Other measures include emergency treatment boxes on all out-gardens. Inspection of coolies is made fortnightly on pay days, and there is a house to house inspection of the lines daily. Carriers of disease are detected whenever possible and put under treatment. Fly and mosquito campaigns are going on, sanitary gangs are working in each line. Clinics have been started for child welfare, venereal diseases, leprosy and kala-azar. Weekly lectures on medical subjects are given to the hospital staffs. Health demonstrations aided by coloured posters are given to the coolies.

These activities are illustrated where possible, and details are given as to their results.

The present hospitals are quite unsuitable and inadequate. Plans are shown of the new ones now in course of erection and these are explained. The proposed administration of these hospitals is considered in detail. At present the patient's relatives are given leave to look after him, and this often results in very bad nursing and the giving of unsuitable food. The wards of the new hospitals are very much larger than those of the old, and it is proposed to have a trained attendant on duty night and day in charge of each. Accommodation is arranged for a pathological laboratory, an operating theatre, and a lying-in ward. A separate outpatient block is provided so as to keep the main hospital as clean and quiet as possible.

Results obtained to the date of writing are given.

Smallpox, of which there were always odd cases and occasional severe epidemics, has been completely abolished. The two or three cases occurring during the last year were strangers from surrounding villages, who came into our lines. All our own coolies have been vaccinated within the last 18 months.

Malaria has been reduced considerably, dysentery is much less than before, cholera is almost unknown. Other diseases are also decreasing as shown by the tables given. The birth-rate is rising considerably. There is a decrease in the death-rate of working coolies, but an increase in that of young children and of old people. This is only apparent and is due to the more careful keeping of records.

The conclusions to be drawn from this work are as follows:

To prevent disease, no one method is adequate, but every method must be combined and persisted in.

The most important factor is to assure a thorough cure of each patient, and for this "follow-up" treatment is necessary. This is impossible without keeping careful records. The elimination of "carriers" thus accomplished probably does more than anything else to reduce disease.

The second factor is good water-supply and conservancy system. Apart from Malaria, probably some 90 per cent. of sickness is due to this lack. Evidence is produced to show the ravages of bowel diseases and worm infestations.

The third factor is adequate housing and sanitation.

The fourth factor is a first-class hospital and full equipment. This will not show an effect on the sick rate as much as the former factors, but will very materially reduce the death-rate.

The cost of disease is enormous, necessitating as it does the recruiting of new labour to replace wastage, outgoings in sick pay and attendances, lack of labour just when most needed to assure a large crop. It would be no exaggeration to put this cost at Rs. 3 per head per year.

The cost of prevention is also great, but not nearly so great as the former. Re. 1 per head per year for 5 years, followed by 8 annas per head per year or even less for perpetuity would be adequate to obtain the desired results.

Much is being accomplished by individual effort in an isolated way all over the world. When will these efforts be combined under one *Generalissimo*, not only to fight disease but the callous indifference which perpetuates it?

**48. Aspects Cliniques et Épidémiologiques de la Méningite Cérébro-spinale Épidémique dans l'Inde Portugaise.** **De Mello, I. Froilano, Col.** (*Director-General, Medical Services in Portuguese India*).

La méningite cérébro spinale épidémique est une maladie nouvelle dans la nosologie de Gôa. Actuellement endémique dans le département de Salsete et donnant des épisodes aigus plus ou moins meurtriers, son histoire est des plus intéressantes à plusieurs points de vue, d'autant plus que les descriptions de cette maladie dans les tropiques ne sont pas abondantes. Sûrement importée vers 1918 ou 1919, on n'a pu s'assurer définitivement de quelle contrée elle serait venue: c'est probable qu'elle fût importée de l'Afrique Orientale Anglaise par quelque émigrant porteur de germes. Comme il arrive dans presque tous les pays, elle a été confondue avec des maladies les plus diverses.

Ce sont surtout les enfants de 2 à 7 ans, ensuite de 7 à 14, bien plus rarement de 15 à 18, qui lui payent tribut et les causes des décès ont été attribués par les cliniciens à *malaria cerebrale*, *vomissements*, *convulsions*, *vermineuse*, *acidose*, etc. etc. Il ne sera pas déplacé de dire qu'au début on remarquait de rares cas chez les adultes que l'on ne voit plus maintenant.

En 1921 on fait des recherches sur sa nature. Frappé par l'allure épidémique, et après avoir contrôlé le non fondé des hypothèses malarieuses, vermineuses etc., l'auteur pose le diagnostic de méningite cérébro spinale épidémique, ayant isolé le méningocoque qui, faute de sérums spécifiques monovalents, n'a pu être identifié quant à son type. Des mesures énergiques prophylactiques prises alors jugulent l'épidémie qui était confinée à trois ou quatre villages contigus.

Bientôt, la maladie se présente sous forme de cas sporadiques. Les cliniciens n'acceptent pas le diagnostic, frappés par la faible mortalité n'atteignant pas 15 per cent. et par un soi-disant manque de quelques signes classiques (Kernig etc.), et la maladie progresse, envahit des villages de proche en proche, défiant souvent, comme c'est le cas dans cette maladie, une interdépendance directe et dans le courant de 1926-27 donne une formidable épidémie.

Une commission nommée par le Gouvernement, composée de médecins officiels et non officiels, parmi lesquels ne se trouvait pas l'auteur,



confirme absolument les recherches de 1921. On isole le meningocoque B de quelques cas, on montre que dans les foyers où il y avait eu de l'épidémie on trouve des porteurs de germes, types B et A, on montre que les signes de Kernig et Brudzinsky existent dans la plupart des cas, les modalités qu'ils présentent, la façon comme on doit les chercher et on vérifie non seulement le non fondé des hypothèses malaïenne, vermineuse, acétonémique, gastro-entéritique, grippale, mais encore qu'il ne s'agissait pas d'une *maladie nouvelle et d'origine inconnue*, opinion qui pernaît dernièrement cours parmi le corps médical de la Province. Cette évolution de la méningite cérébro spinale à Salsete et les doutes et les objections qu'elle a soulevés sont pour les médecine aux tropiques, une leçon pleine de renseignements d'une incontestable utilité.

On décrit dans ce mémoire le cadre général de la maladie ainsi que les formes cliniques fulminantes, sigues et frustes, on discute la valeur diagnostique et pronostique des symptômes, on rapporte les données anatomopathologiques de deux ou trois autopsies que l'on a pu faire, les caractères du liquide céphalo rachidien, les recherches bactériologiques et on rapporte les résultats de l'énergique campagne prophylactique que l'on a faite à Gôa pour combattre l'épidémie, visant surtout la prophylaxie des rhynopharynx des suspects, prophylaxie qui s'est étendue pour tout le département de Salsete, comprenant des milliers de personnes.

La maladie, est comme partout ailleurs, une rhynopharyngite primaire et dans quelques villages c'est surtout sous cette forme qu'elle apparaît, donnant des épisodes aigus meningococciques, avec ou sans localisation méningitique, sous forme de cas sporadiques isolés ou de manifestations épidémiques. La maladie est actuellement endémique dans le département de Salsete et a donné des foyers, peu étendus, dans les autres départements de la province de Gôa.

**49.** The Sanitary Management of the Principal Pilgrim Centres in the Bombay Presidency. **Munsiff, J. D.,** L.R.C.P. (*Director of Public Health, Poona*).

**50.** The Time-Factor in Disinfection, Disinsectization and Sterilisation: a Practical Method of Control. **Phipson, E. S.,** Major, M.D., M.R.C.P., D.P.H. (*Health Officer, Port of Aden*).

All methods of bulk disinfection in which heat is the lethal agent depend on (a) The effective degree of heat employed; (b) The time during which it is operative; (c) The penetration of the heat to every part. The *maximum* degree of heat employed is easy to regulate, but the time during which it is effectively operative, the *minimum degree* of interior heat and the degree of penetration attained present problems of some difficulty, to which no disinfecting plant provides an adequate answer.

It is self-evident that, for heat-disinfection to be economical as well as effective:—

(i) The minimum degree of interior heat must be little in excess of what is known to be just sufficient for the purpose in view.

(ii) It must be applied for a period of time little in excess of what is known to be effective.

(iii) It must penetrate to *every portion* of the material to be disinfected.

No existing plant will ensure that these axiomatic requirements are met, for the reason that the penetration of the heat into the interior of the material, is left almost entirely to chance, or at most only proved or disproved after the process is over; and the time-factor, on which the success or failure of the process so largely depends, is commonly ignored.

Recording instruments, gauges and thermometers are concerned only with the temperature inside the shell of the disinfecter and on the outer surface of the material and give no information regarding heat penetration into the mass of the material.

The resistance to the passage of heat in any given case depends not only on the character of the heat employed, e.g., dry heat, current steam, or super-heated steam but also on factors which are incalculable i.e., with the nature of the material, its physical state and its method of packing, but no disinfecting process can be said to be complete, scientific, reliable or economical unless it takes into account the time-factor, both as regards the time required to attain a given minimum interior temperature and the time during which that temperature is operative.

It was with the object of obtaining these important data that the writer devised the automatic temperature indicator described in this paper.

The device consists of a small heat-operated electrical control, which depends on the softening, under the influence of a particular degree of heat, of a small bar of fusible alloy. This can be designed to soften at any required temperature within the range required for disinfection or other similar process. The temperatures found most generally useful are 80°C., 99°C., 110°C., and 115°C., a range which will cover all processes of disinsectisation, disinfection and sterilisation for surgical purposes.

The device is electrically connected by flexible leads with a bell-circuit outside the shell of the disinfecter, and when the device, which has been previously placed in that part of the mass of material to be disinfected which is judged to be most inaccessible to heat, makes an electrical contact, it indicates that that particular part has attained a predetermined minimum temperature, and the bell rings outside. *Effective* disinfection begins precisely at that point of time and is continued as long as is considered necessary.

The device is simple, inexpensive and easily fitted to existing disinfection plants, and has in the writer's experience afforded a considerable sense of security in dealing with epidemics with limited resources.

**51. Cholera Bivivaccin and Anti-Cholera Vaccine.** A Comparative Field Test. **Russell, A. J. H.**, Lt.-Col., C.B.E., M.A., D.P.H., I.M.S. (*Director of Public Health, Madras Presidency*).

Bivivaccin and anti-cholera vaccine were used in the constantly infected areas of Tanjore and South Arcot districts between December 1925 and March 1927.

The vaccines were administered only in villages which were at the time actually infected with cholera.

The work was carried out in 360 villages with a total population of 647,454, but only those hamlets which, in the opinion of the Medical Officer, afforded the best opportunities for vaccination work were selected. Moreover, in the average house, certain members of the household refused treatment and these persons were used as controls. These two factors introduced elements of selection in the groups of treated and unprotected, but that cannot be altogether avoided in field work of this kind. Otherwise the work has been carried out in such a manner as to exclude as far as possible any selective influence, for instance, as regards sex and age.

The administration of bile pills is sometimes followed by acute diarrhoea of a severe type.

(a) Amongst the 4,982 persons given the full course of bilivaccin, 18 attacks and 4 deaths occurred, giving a percentage attack incidence of 0.36 as compared with percentage attack incidence amongst controls of 2.02.

(b) If direct contacts only are taken, the percentage attack incidence amongst the cases given the full course of bilivaccin is 1.8 as compared with the percentage attack incidence amongst controls of 20.2.

(c) The percentage of mortality amongst unprotected persons attacked was almost twice that of the attacked in the group of persons given bilivaccin.

(i) As regards anti-cholera vaccine, amongst 17,160 persons given one dose only 130 attacks and 44 deaths occurred giving a percentage of attack incidence of 0.34.

(ii) Amongst 8,485 persons who received two doses of anti-cholera vaccine, the percentage of attack incidence is 0.37.

(iii) Amongst 29,254 controls, the percentage attack incidence was 1.67.

(iv) If only direct contacts are taken, the percentage of attack incidence in the similar cases are 2.8, 2.5 and 14.1 respectively.

(v) The unprotected attacked were 4.5 times more frequent than those inoculated with two doses, or if direct contacts alone are taken, the unprotected were attacked 5.6 times more than those inoculated twice, and the percentage of mortality amongst the unprotected attacked persons was 5.8 times higher than that amongst those who were given two doses of the vaccine.

The indication seems to be that the bilivaccin (full dosage) and anti-cholera vaccine (double dose) give much the same degree of protection from attack, but in the two doses of anti-cholera vaccine only 12,000 millions of cholera bacilli are inoculated, whilst in the full treatment with bilivaccin over 200 billions of bacilli are swallowed.

*Statistical Analysis of the Data:*—The following table gives the experimental data arranged according to dosage and attacks amongst the groups of protected and unprotected persons.

Five fourfold correlation tables are attached as an appendix. Those for  $B_1$  and  $B_2$  do not show any relationship which cannot be

attributed to chance, as determined by  $X_2$ ,  $P$  and  $r_p$ . The uniformly negative and significant correlation coefficients indicate that, in general, the treated acquired a certain degree of protection from attack.

		*A <sub>1</sub> .			*A <sub>1.5</sub> .			*A <sub>2</sub> .		
		Not attacked.	Attacked.		Not attacked.	Attacked.		Not attacked.	Attacked.	
			Recoveries.	Deaths.		Recoveries.	Deaths.		Recoveries.	Deaths.
Treated	..	17,030	86	44	17,117	29	14	8,484	29	2
Controls	..	28,765	305	184	28,765	305	184	28,765	305	184
Contacts	..	2,971	305	184	2,971	305	184	2,971	305	184

\*A<sub>1</sub> gives particulars of persons treated with only one inoculation of anti-cholera vaccine.

\*A<sub>2</sub> gives particulars of persons treated with two inoculations of anti-cholera vaccine.

\*A<sub>1.5</sub> gives particulars of persons 5 days after the first inoculation of anti-cholera vaccine.

		*B <sub>3</sub> .			B <sub>3</sub> .			*B <sub>2</sub> .			*B <sub>1</sub> .		
		Not attacked.	Attacked.		Not attacked.	Attacked.		Not attacked.	Attacked.		Not attacked.	Attacked.	
			Recoveries.	Deaths.		Recoveries.	Deaths.		Recoveries.	Deaths.		Recoveries.	Deaths.
Treated		4,964	14	4	4,971	9	2	472	9	2	592	10	9
Controls		10,782	129	93	10,782	129	93	10,782	129	93	10,782	129	93
Contacts		1,950	129	93	1,950	129	93	1,950	129	93	1,950	129	93

\*B<sub>3</sub> gives particulars of persons treated with three doses of bili-vaccine.

\*B<sub>2</sub> gives particulars of persons three days after the third dose of bili-vaccine.

\*B<sub>2</sub> gives particulars of persons treated with two doses of bili-vaccine.

\*B<sub>1</sub> gives particulars of persons treated with only one dose of bili-vaccine.

The coefficients of correlation between treated and attacked, for both contacts and controls, are given below:—

	Particulars.			r.	P.E.
1.	A <sub>1</sub>				
	(a) For whole group	..	..	.. -0.1773	
	(b) For contacts only	..	..	.. -0.2776	±0.0180
2.	A <sub>1s</sub>				
	(a) For whole group	..	..	.. -0.3579	±0.0131
	(b) For contacts only	..	..	.. ..	.. ..
3.	A <sub>2</sub>				
	(a) For whole group	..	..	.. -0.2706	±0.0151
	(b) For contacts only	..	..	.. -0.4526	±0.0187
4.	B <sub>3</sub>				
	(a) For whole group	..	..	.. -0.3503	±0.0203
	(b) For contacts only	..	..	.. -0.4409	±0.0250
5.	B <sub>3s</sub>				
	(a) For whole group	..	..	.. -0.4185	±0.0195
	(b) For contacts only	..	..	.. ..	.. ..

From these figures it is possible to make the following inferences.

(a) The administration of a single dose of anti-cholera vaccine generally gives some degree of protection.

(b) The large difference between the coefficients for A<sub>1</sub> and A<sub>1s</sub> groups, shows that, five days after inoculation, protection is considerably increased. The difference is  $-0.1806 \pm 0.0223$ , which is significant.

(c) The value of A<sub>2</sub> which is as high as  $-0.4526 \pm 0.0187$  indicates that the two doses of anti-cholera vaccine gives a high protection, even to those who were in immediate contact with cholera cases.

(d) The value for B<sub>3</sub> show that a complete course of bili-vaccine also confers a degree of protection comparable with that of group A<sub>2</sub>.

(e) The coefficient for B<sub>3s</sub> is not significantly different from that for B<sub>3</sub>, the difference being  $-0.0682 \pm 0.0281$ .

The question whether bili-vaccine or anti-cholera vaccine gives higher protection cannot be definitely decided at the present stage. Further experiments are being carried out in constantly infected areas, and when this work is completed, it is hoped that it will be possible to give a definite opinion on this point. It is to be noted however that the power of protection of neither can be compared with the high protective power of vaccine lymph against smallpox, the correlation coefficient of which has been shown by Karl Pearson to be as high as + 0.85.

TABLE I.  
*Treatment with only one dose of anti-cholera vaccine.*

A <sub>1</sub>	Not attacked.	Attacked.	TOTAL.
Not treated ..	23,765	489	29,254
Treated ..	17,030	130	17,160
TOTAL ..	45,795	619	46,414

TABLE II.

*Five days after treatment with only one dose of anti-cholera vaccine.*

A <sub>1</sub>	Not attacked.	Attacked.	TOTAL.
Not treated ..	28,765	489	29,254
Treated .. ..	17,117	43	17,160
TOTAL .. ..	45,882	532	46,414

TABLE III.

*Treatment with two inoculations of anti-cholera vaccine.*

A <sub>2</sub>	Not attacked.	Attacked.	TOTAL.
Not treated ..	28,765	489	29,254
Treated .. . .	8,454	31	8,485
TOTAL .. ..	37,219	520	37,739

TABLE IV.

*Treatment with a full course of bili-vaccine.*

B <sub>2</sub>	Not attacked.	Attacked.	TOTAL.
Not treated ..	10,782	222	11,004
Treated .. ..	4,964	18	4,982
TOTAL .. ..	15,746	240	15,986

TABLE V.

*Three days after the third dose of bili-vaccine.*

B <sub>2</sub>	Not attacked.	Attacked.	TOTAL.
Not treated ..	10,782	222	11,004
Treated .. ..	4,971	11	4,982
TOTAL ..	15,753	233	15,986

**52.** Population and Public Health in India. **Russell, A. J. H.,** Lt.-Col., C.B.E., M.A., D.P.H., I.M.S. (*Director of Public Health, Madras Presidency*).

Of all Eastern countries, India seems to be peculiarly liable to extensive and fatal epidemics of cholera, smallpox and plague, and suffers, in addition, from frequently recurring periods of famine or scarcity. Public Health Departments of this country, therefore, are compelled to spend a disproportionate part of their time and energy in the control of epidemic diseases, whose severity is often enhanced by drought and lack of sufficient food.

Under existing conditions, also, the unreliable nature of the available mortality statistics can permit of only an imperfect interpretation of the value of public health measures, and no one engaged in health work in India can afford to neglect this aspect of the subject. The establishment of the value of public health measures is at all times a delicate task, beset with many practical difficulties, and the very magnitude of the epidemics which so regularly devastate large areas in India only add to the difficulty. While therefore drawing attention to the tremendous importance of epidemiological research, and stressing the urgency of employing additional trained workers in this field, the purpose of the present paper is to invite notice to the question of population in its relation to public health in general.

We are of opinion that the problem of population is of far more importance to the economic progress of India than has so far been admitted. In fact, we would emphasise this by stating that the problem of the future development and happiness of the Indian peoples is one of population and would categorically ask the question: what is the use of public health activities when the inexorable pressure of population growth insists in producing conditions which periodically result in uncontrollable waves of fatal epidemic disease.

*The population problem in India:*—Although opinions differ on the subject, there seems to be little reason to doubt that India is already a densely populated country. It has recently been maintained that a large percentage of cultivable land in India is still unused, but actual facts go to prove that this is an extravagantly optimistic estimate, and in our opinion the time is not far distant when the pressure of population

in India will have to be seriously considered by public health workers, economists and politicians.

The problem of human population has been one of interest to the race throughout the world's history. Fear of over-population must have played a great part in originating infanticide among uncivilized races and among the ancient Greeks and Romans. Malthus announced his belief that the cause of human misery was the tendency of mankind to increase at a much faster rate than the means of subsistence, and he regarded over-population as the cause of famine as well as disease. He admitted that the principle of population could not absolutely produce a famine, but "it prepares the way for one and by frequently obliging the lower classes of people to subsist nearly on the smallest quantity of food that will support life, turns even a slight deficiency from the failures of the seasons into a severe dearth; and may be fairly said to be one of the principal causes of famine." (Essay, p. 290.)

The problem was first discussed by Malthus Ricardo and Mill but their work, which was received with scorn and obloquy, is now being given more wide recognition, and serious attempts are being made to explain its many implications.

*Population growth curve.*—In dealing with the problem, it seems necessary to have some idea of the rate of increase of population in any given area, and this can perhaps be best demonstrated by a curve which describes that increase in graphical form, and which can be further used in order to predict future growth. Dr. Raymond Pearl's population growth curve would seem to satisfy these requirements. The formula

$$y = \frac{k}{1 + e^{a_0 + a_1x + a_2x^2 +}}$$

has been used by him in the construction of curves which demonstrate population growth for practically every western country and for Japan. In his own words, "the population of a politically defined area must necessarily have an upper limit of population living on that area, and that the rate of growth of population, which is proportional to the population, gets less as the population approaches the maximum or the asymptotic population."

Pearl's formula in its simplest form:

$$y = \frac{b}{c + e^{-ax}}$$

has been applied to the census figures of population for India, for the Presidencies of Bombay and Madras, and for the cities of Bombay, Madras, and Madura. In the practical application of the growth curve to presidencies and cities in India, the following limitations have been constantly kept in mind—

- (i) the frequent visitations of epidemic diseases such as plague and cholera.
- (ii) the occurrence of famine.



- (iii) the small number of census figures available for study and  
 (iv) the degree of reliability of the available data.

The curves of best fit are given below in each case:—

Province or City.	Equations of Growth Curves.
India .. ..	$y = \frac{103.125}{-0.0581604 \times 3.125 + e}$
Madras Presidency ..	$y = \frac{102.05076}{-0.0559651 \times 2.75220 + e}$
Bombay Presidency ..	$y = \frac{173.33823}{-0.0405512 \times 6.22243 + e}$
Madras City ..	$y = \frac{98.89346}{-0.030132 \times 1.60244 + e}$
Bombay City ..	$y = \frac{3.00719}{-0.04175 \times 0.25303 + e}$
Madura City ..	$y = \frac{123.79639}{-0.0450715 \times 0.719416 + e}$

These curves, if they indicate anything, seem to point to the conclusion that the populations of Bombay and Madras Presidencies have reached almost to saturation point under present conditions. Bombay City is clearly overcrowded; Madras City is approaching the maximum population possible under present conditions. Only in Madura City do we find that considerable additions to present numbers can still be made before the asymptotic population is reached. This contrast, so far as City population growth curves are concerned, indicates that Town Planning Committees and Improvement Trusts might with advantage make use of this formula in order to forecast future population growth in the towns in which they work.

*Effect of over-population on Public Health Activities.*—The question of over-population must always be considered in relation to Public Health measures. If mankind goes on filling the earth with numbers at the present rapid rate, Nature will step in and eliminate the excess in spite of the best-laid plans of Public Health Departments. Certain questions demand an answer: why should money be spent on the criminal, the pauper, the indolent, and on the good-for-nothing? "Why are there not schools for precocious and brilliant children? . . . why are the rotten timbers of society repaired and painted, while the more solid framework is abandoned to wind and weather?" (Prof. East.) The type of social sanitation suggested by these questions deserves more than passing attention.

As compared with European countries, India presents:—

- “(a) a smaller natural increase in spite of a high birth-rate;
  - (b) a smaller fecundity in spite of a larger percentage of married persons;
  - (c) an infantile mortality twice or thrice or even four times as high;
  - (d) a much smaller average expectation of life with a steady downward tendency;
  - (e) a high death-rate among young mothers; and lastly
  - (f) in common with European countries the tendency to increase is greater among the lower classes than among the higher.”
- (P. K. Wattal.)

The issue is not only that the population is outrunning the means of subsistence but that associated with it are unemployment, rising prices, and further reductions of the standard of living of agricultural and industrial workers. The criticism may be made that no account has been taken of the possibility of improved agricultural methods producing much larger quantities of food, but it does not seem likely that this can influence the situation to any extent in the long run.

*Over-population and Food Supply.*—As regards food supplies in India, it is not possible to speak with great certainty on the subject, as accurate and complete figures, even for the more important crops, cannot be obtained. Confining attention for the present to the Madras Presidency, it would appear that the population is within a million of the upper asymptotic limit and that even now, considerable quantities of rice are being imported from Burma and Ceylon. Although there does not seem to be cause for immediate alarm, unless scientific agriculture can show the way to additional food supplies in the near future, the problem will not be one of easy solution, as the food-exporting countries of the world are themselves rapidly approaching saturation point in respect of population and no surplus will be available for export.

*Conclusion.*—It is not the purpose of this paper to lay down definite conclusions on population or public health problems or to advocate the adoption of any particular course of action. The intention is merely to indicate the nature of these problems and to point out some of the factors which must be taken into account in any survey of the question.

**53.** Experimental Observations on Activated Sludge in Calcutta. **Stewart, A. D.**, Lt.-Col., I.M.S. (*School of Tropical Medicine, Calcutta*). (For abstract see p. 140).

**54.** Recent Statistical Report of the Health of the Imperial Japanese Navy. **Dr. Takasugi, S.** (*Medical Corps, Imperial Japanese Navy, Tokyo*).

**55.** The Medical Inspection of Indian School Children at Simla. **Webb, J. R. D.**, Major, O.B.E., D.P.H., I.M.S. (*Medical Officer of Health, Simla*).

The medical inspection of school children and school premises at Simla was begun by me in September 1923. Prior to this date, this

work was not considered to be one of the duties of the Medical Officer of Health, and no system of the kind existed. The present system is unique, because it exists nowhere else in the Punjab Province.

Simla with its season population of about 45,000, collected within a restricted area, is perhaps particularly well situated for work of this nature. Until December 1924, only the primary classes of boys between the ages of 6 to 11 years were dealt with. The total number so handled was 731. In late 1924, the work was extended to all boy schools at Simla, while in 1926 all girls attending schools came under medical supervision. At the present time it is estimated that there are about 2,500 boys and about 600 girls who are under regular medical inspection at the 27 schools in Simla. The cost is estimated at approximately one anna per child per mensem, excluding the cost for instruments, printing of stationery and medicines.

The system of medical inspection at Simla, which is now in practise, has been evolved by closely studying similar systems in other parts of the world.

The system embodies :—

- (1) The medical inspection of each child, once every two months, with a view to the prevention and cure of disease.
- (2) The assured treatment of affected children.
- (3) Reports of the above results, which are combined to form an annual report.
- (4) A monthly inspection of school premises, followed by reports combined to form an annual report.

The Simla population is very largely a seasonal one, fluctuating with the change of Government office employees. Changes amongst the children we are dealing with are inevitable. This tends to retard the rapid and complete success of the work. The following are the results obtained during the past four years :—

- During 1923-24, out of 731 boys examined, 67 per cent. were referred for treatment at the first inspection, whereas this figure was reduced to 33·03 per cent. by the end of 1924. As already stated, during 1923-24, only the primary classes at the boys' schools were dealt with, consequently these results do not direct comparison with those of subsequent years. In 1925, 81 per cent. of the boys were referred for treatment at the first series of inspections, while by the end of the year, this figure was reduced to 30 per cent. In 1926, at the first series of inspections, 43 per cent. of the boys and 75 per cent. of the girls were referred for medical treatment, also 45 per cent. of the boys and girls were recommended for attention by the masters and mistresses for uncleanness and other minor conditions. By the end of the year, these figures were reduced to 15 per cent. of the boys and 43·2 of the girls requiring further recommendation for medical treatment, while 21 per cent. of boys and 20 per cent. of girls still required attention by the masters and mistresses. In 1927, at the first series of inspections, 39·6 per cent. of the boys and 63 per cent. of the girls were recommended for medical treatment while 44·7 per cent. of the boys and 37·3 per cent. of the girls required attention by masters and mistresses. Averages of

height, weight and chest measurements for Simla school boys and girls of varying ages were prepared in 1925-26.

The boys and girls now attending the 27 schools at Simla are of good physique and they comply with the standards already referred to. These results have been achieved by constant medical supervision and treatment, together with a system of regularised exercise by a *games-for-all movement*, and with a scheme for the supply of midday meals for the children.

The Simla Municipality provides an annual grant for the provision of spectacles to children whose parents are too poor to pay. In 1925, 4.1 per cent. of the children were found suffering from defective vision. These cases were corrected with spectacles. In 1926, 1.5 per cent. of the children were suffering and were treated. In 1927, 1 per cent. were suffering, and their vision was corrected with spectacles. Hypermetropia and Hypermetropic astigmatism accounted for the majority of the cases.

In 1925, 11.4 per cent. of the children were found suffering from dental diseases. In 1926, 15 per cent. required treatment for dental diseases. During that year, treatment was privately arranged for those children whose parents agreed to pay for the treatment. By the end of the year, the percentage requiring treatment was reduced to 5.4 per cent., but many of the poorer children did not receive treatment. By repeated representations concerning the treatment of this group of diseases, the Simla Municipality provided a special grant in 1927, for the treatment of those children whose parents were too poor to pay. At the beginning of 1927, 13.7 per cent. required treatment, but by the end of the school year only \* per cent. remained to be treated.

In 1925, 51.3 per cent. of the children were found to be suffering from enlarged tonsils; by the end of the year incidence was reduced to 7.9 per cent. In 1926, 22 per cent. were found suffering from enlarged tonsils; by treatment, the incidence was reduced to 3.7 per cent. by the end of the year. In 1927, 15.3 per cent. were found suffering, and the incidence was reduced to \* per cent. by the end of the year.

Not a single school child at Simla escapes either primary vaccination or re-vaccination against small-pox. With the advent of the season population to Simla from the plains, small-pox is always introduced, yet during the last 4 years, only 3 school children have been attacked with modified small-pox.

Acute malaria is not contracted at Simla. All acute cases prove to be relapses from an original infection of this disease in the plains. In 1925, 4 cases of acute malaria were recorded. Enlarged spleen incidence, at the first series of inspections, was 16.4 per cent., while by the end of the year, the incidence was 0.3 per cent. In 1926, 12 acute cases were recorded. Spleen incidence was much reduced when compared with that of 1925. Girls suffered more than boys. In 1927, enlarged spleen incidence was only 0.5 per cent.

Goitre is not a disease which is much found amongst our children, although McCarrison writes, "20 per cent. of the population in the

Himalayas suffer from Goitre." I attribute the comparative absence of this disease amongst our children to the fact that a large proportion have an annual change to the plains.

The percentage of Ear diseases and defective hearing is very low amongst the children. Many suffer from wax in the ears, which is most pronounced during the rains. A few cases of middle-ear disease have been detected and submitted to operation.

Since regular school medical inspection was introduced at Simla, there has been a very marked improvement in the general state of cleanliness amongst the children. The standard is now high and bears comparison with that of western countries. An interesting feature of this work is the co-operation which exists at Simla between the school work and that of the Infant Welfare Institution.

Infant Welfare Index Cards for Toddlers, whose career has been guided by the Lady Health Visitors from birth to the toddler state of life, are passed to the School Doctors. In consequence, a complete previous history of such children is obtained at the time of their entering any of the 27 schools at Simla.

These statistical results show that a systematically organised medical inspection of school children has a direct beneficial bearing on the community and in relation to Preventive Medicine.

I do not wish you to suppose that this work only consists of the detection and cure of diseases; our ideal aim is the increase and spread of knowledge in health teaching, for after all the school is the logical place to inculcate the value of Preventive Medicine.

Our school medical organisation coupled with our Propaganda work at Simla has achieved a success, during the last four years, which I never anticipated could be possible, when I introduced this work in September 1923.

**56.** The Activities of Medical and Sanitary Organisation of the Chinese Eastern Railway Zone in the Anti-plague and Anti-cholera Campaigns. **Dr. Wei-Likun** (*Head of the Medico-Sanitary Department, Chinese Eastern Railway*).

*General Remarks.*—The geographical situation of the Chinese Eastern Railway Zone and its boundaries. The population of the zone and its occupation. The climate of the northern provinces through which the Chinese Railway penetrates.

*Medical and Sanitary Organisation and its plan of work comprising:* hospital and ambulance work and special forms of therapy.

*Hygiene Laboratory and its work in connection with the epidemics.*

*Sanitation comprising the following:*—The general sanitary supervision of the waterworks, the living houses and all the structures and workshops, where the workmen are employed. The general sanitary supervision of foods and products for nutrition. The sanitary supervision of the railway schools and school hygiene.

*Assanation and disinfection of all the public Railway buildings.*

*The incidence of infectious diseases on the Chinese Eastern Railway.*

*Brief outline of the epidemics on the Chinese Eastern Railway.*—The activities of the Medical and Sanitary Department in the anti-plague and cholera campaigns, the Central Railway Special Sanitary Anti-plague Committee and measures adopted in the zone of the Chinese Eastern Railway for the prevention of plague and cholera. The local special Railway Sanitary Anti-plague Committee and their activities. Quarantine plague stations and their work. Plague observation cars. The contact and co-ordination of Chinese Eastern Railway Medical and Sanitary Organisation with the North Manchurian Plague Prevention Service in the anti-plague campaigns. The limitation of passenger traffic along the Chinese Eastern Railway. Anti-plague literature.

*Chinese Eastern Railway Anti-cholera Work.*—The epidemiology of cholera in the Chinese Eastern Railway Zone. The Central Railway Sanitary Committee in its work in combating cholera. The local Railway Sanitary Committees and their anti-cholera work. Hospitalisation of cholera patients. Special personnel for the detection and treatment of cholera patients. The activities of the bacteriological laboratory in the anti-cholera work. The work of inoculation units.

*Work of the Medical and Sanitary Organisation of the Chinese Eastern Railway in combating other epidemics.*

*Conclusions.*—(1) The existence of special medical and sanitary organisation on the Chinese Eastern Railway is historical as it is the only medical institute based on modern scientific principles. (2) During the 25 years of its existence the Medical and Sanitary Organisation of the Chinese Eastern Railway took an active part in guarding the health of the people of North Manchuria, and applied in its work scientific prophylactic measures. (3) In combating the infectious and contagious diseases the Medical and Sanitary Organisation played the leading rôle in organising the most important epidemiological measures against plague and cholera in North Manchuria. (4) In fighting plague and cholera the Medical and Sanitary Organisation of the Chinese Eastern Railway always co-operated with the North Manchurian Plague Preventive Service and with other organisations which took an active part in the anti-plague and anti-cholera campaigns. (5) The Medical and Sanitary Organisation of the Chinese Eastern Railway having a net of hospitals and other medical institutions with sufficient qualified medical and sanitary personnel throughout the North Manchurian Railway Zone from western and eastern Russian boundaries to the boundary of Southern Manchuria comprising in all 1,600 miles is the only organised medical organisation which is enabled to combat the epidemics in the Railway Zone. (6) To attain greater success in preventing the spread of infectious and contagious diseases in Northern Manchuria it is necessary to establish in the most dangerous points in Northern Manchuria sanitary service which at present does not exist. (7) In order to diminish the present high rate of infectious diseases amongst the Chinese population it is necessary to establish in Northern Manchuria a Medical University for Chinese students, which would in the course of 5 or 6 years give the country a sufficient staff of qualified physicians who with knowledge of the language and the local conditions would greatly facilitate the anti-epidemic work.

## MATERNITY AND CHILD WELFARE.

**57.** Des Indications de l'emploi des injections de Post Hypophyse chez le parturientis epuisees par les chaleurs de l'ete dans le Delta Tonkinos. Dr. **Jourdran, E. E. M.** (*Director-Local de la Sante du Tonkin, Hanoi, Indo-Chine*).

**58.** Statistiques de la Maternite de l'hospital Lanese oin annees 1924, 1925, 1926. Dr. **Jourdran, E. E. M.** (*Director-Local de la Sante du Tonkin, Hanoi, Indo-Chine*).

**59.** Maternity and Child Welfare. **Ranade, N. L., B.A., M.B., B.S.** (*Poona Seva Sadan Nursing Committee, Poona City*).

**60.** The Organisation of Child Welfare Work, and the Obstacles in its way. Dr. **Young, Ruth** (*Lady Chelmsford League*).

The raison d'être of the work.

Objections to it are based on (1) misconception as to its nature, (2) lack of appreciation of preventive ideas and (3) past mistakes in carrying it on which bring it into disrepute.

Bodies taking up the work are:—(a) Municipalities, District Boards or other "Official" agencies, (b) voluntary societies, (c) a combination of the above two.

Relation to existing public health activities.

Inspection and supervision of the work, need for a special officer for each larger province to direct and be responsible for the work. Advantages of this procedure.

Planning out of the work; registration of births, considerations of finance, staff, premises, etc. Nature of work to be undertaken. Home visiting, Centre work, Ante-natal work, Accessory activities, Record-Keeping, Voluntary workers, Propaganda work.

Adequate supply of trained Health Visitors essential to the work. Special training of medical women also required.

Obstacles: lack of funds is the usual one advanced. Admittedly a difficulty, but more apparent than real. Willingness to spend money depends on the advantages considered to accrue from the expenditure. The task therefore is to educate people, including the medical and nursing professions, to realise the actual cash return given by health. This education and propaganda work should be given more time, thought and money.

Other obstacles: conservatism and illiteracy of the people, tendency to laissez faire, lack of workers, work being done by amateurs.

## PLAGUE.

**61.** An Unrecognised Type of Plague. **Choksy, N. H., Khan Bahadur, C.I.E., M.D. (Hon. Causa), Freiburg, i.Br., F.C.P.S., L.M. & S., Bombay (Vice-President, College of Physicians and Surgeons, Bombay; Member, Bombay Medical Council; Late Medical Superintendent, Arthur Road and Maratha Plague Hospitals, Bombay, 1888—1921.)**

The Cellulo-Cutaneous Type; forming about 4—6 per cent. in different epidemics in Bombay; the most benign form with the lowest rate of mortality (recovery rate 37 per cent. as compared with 26 per cent. in bubonic type. Spreading local necrosis of tissues which may be observed on scalp, neck, face, back, neck, chest, arm and forearm, abdominal wall, lumbar and gluteal regions, etc., often exposing the bones, deep organs, intestines, etc.

**62.** Experiments on the Transmission of Plague by *X. cheopis* and *X. astia*. Dr. **Goyle, A. N.** (*United Provinces*). A series of plague transmission experiments were carried out, on the lines developed by the Indian Plague Commission, at Lucknow during the last plague season (1926-27). Out of 52 experiments in which *X. cheopis* was used a successful transmission was obtained in twenty-five, whilst under exactly the same conditions nine out of 52 experiments with *X. astia* were successful. Experiments were also made in order to determine the relative efficiency of males and females of the two species. The results obtained indicate that in each case the male was the better transmitter under the conditions of the laboratory. Climatic conditions under which continuous transmission can be obtained have also been studied.

**63.** Plague. **Mackie, F. P.**, Lt.-Col., O.B.E., I.M.S. (*Director, Haffkine Institute, Bombay*). Paper opening discussion at joint meeting of the Far Eastern Association of Tropical Medicine and the Committee of the Health Service of the League of Nations on Plague. (For abstract see p. 140).

**64.** Problems of Pneumonic Plague. Dr. **Wu Lieh Teh**, M.D., Sc.D., etc. (*Director and C. M. O., Manchurian Plague Prevention Service, Harbin*).

- I. Historical Sketch.
- II. Epidemiology of Pneumonic Plague.
  - (a) Rise of Epidemics.
  - (b) Spread of Epidemics.
  - (c) Decline of Epidemics.
- III. Pathology of Pneumonic Plague.
- IV. Infectivity.
- V. Value of vaccines and serums in Pneumonic Plague.
- VI. Concluding Remarks.

**65.** Perpetuation of Plague in Wild Rodents, especially in the Siberian Marmot. Dr. **Wu Lien Teh**, M.D., Sc.D., etc. (*Director and C. M. O., Manchurian Plague Preventive Service, Harbin*).

1. Survey of Problem in various Plague Areas.
2. Emphasis upon Tarabagar in Transbaikalia, etc.
3. New Hibernation Experiments.
4. Macroscopic and Microscopic Findings.
5. Discussion of Results.
6. Conclusions.

*N.B.*—Slides and microscopical specimens will be shown.



## CHOLERA.

**66.** Non-agglutinating Vibrios, their Relation to the Typical *Vibrio Cholerae*. **Brahmachari, B. B.**, D.P.H. (*Assistant Director of Public Health, Bengal*).

In an endemic area of cholera under our investigation we find that the non-agglutinating vibrios are far more prevalent in the stools of healthy persons and in surface tanks than the agglutinating or typical *vibrio cholerae*, that even in stools of the patients they are more frequent than the latter, and that in the quiescent months of the disease they are the only kinds of vibrio that are met with: Can they explain the outbreaks of the disease and its dissemination?

2. We took 68 of such vibrios for special study. We found

(a) that they did not at all agglutinate with the standard cholera immune serum,

(b) that they produced 'in rabbits' antisera,

(i) which had no action on the typical cholera vibrio,

(ii) which agglutinated their own vibrios at high titre,

(iii) some of which also agglutinated at high titre some more vibrios thus forming serologic groups. So they appeared from their agglutinogenic constitution to be distinct from the standard cholera vibrio and the groups appeared to be so many permanent species.

3. But after having been kept for 7 months,

(a) over 58 per cent. are showing response to the standard cholera antiserum,

(b) one on being grown in its homologous serum has ceased to react to it and is now agglutinating only with the standard cholera serum to the extreme titre of 1 : 8000.

(c) three have produced antisera which in addition to acting on them are also agglutinating the standard cholera vibrio.

4. By passing the typical vibrio cholera intravenously through a rabbit, we have recovered a vibrio (1) which is altogether negative to the standard cholera serum and (2) which is acting on itself only, the titre limit being 1 : 4000.

5. From the above we are inclined to conclude

(i) that the changed vibrios were true cholera vibrio,

(ii) that they had undergone temporary change and

(iii) that they are capable of reversion.

**67.** L'Epidemic de Cholera au Tonkin en 1927. Dr. **Jourdan, E. E. M.** (*Directeur-Local de la Sante du Tonkin, Hanoi, Indo-Chine*).

**68.** Cholera in Hardwar. Dr. **Saranjam Khan and Dunn, C. L.**, Lt.-Col., I.M.S. (*United Provinces*).

Hardwar is a pilgrim centre of exceptional sanctity for the Hindus. Hundreds of thousands of pilgrims visit the place every year but every 12th year bathing in the Ganges at a certain time (Kumbh) in the month of April is considered most propitious. On this occasion there is a large concourse of people numbering a million or two at Hardwar. Kumbh fairs have been notorious for the dissemination of cholera throughout

the world. This year there was a Kumbh fair at Hardwar, the chief day being the 13th of April.

The association of cholera with Hardwar has led many to believe that Hardwar is an important endemic centre of this disease. Bearing on this question cholera mortality statistics of as many years as available for Hardwar and comparative figures for the whole of the United Provinces have been studied.

Every case of cholera that occurred in Hardwar this year (over 90 up-to-date) has been minutely investigated chiefly with regard to the source of infection. The early cases were on investigation found to be imported from Bengal. The cases that occurred subsequent to this importation were traced with striking constancy to the Ganges water especially of that part of the Ganges where most of the bathing takes place and where the sullage water of Hardwar enters the river.

The water of the Ganges from a number of places over a length of 10 miles was daily examined for the presence of vibrios. Over a thousand samples have been examined up-to-date. Frequency of vibrios in the Ganges water was found to vary directly with the degree of pollution, magnitude of the gathering, temperature, etc.

Chemical examination of the Ganges water was also carried out from time to time. The results are in close conformity with the bacteriological findings with regard to the pollution of the river.

Experiments were undertaken to determine the length of time of the survival of cholera vibrios in the Ganges water as compared with well water in Hardwar.

Examination of the sullage water of Hardwar falling into the Ganges showed the presence of vibrios with striking frequency. Parts of the Ganges into which the drains open showed most vibrios.

Over a thousand samples of well water have been examined up-to-date. The results of the examination of water and of permanganation of wells as well as the usefulness of hand pumps in case of covered wells have been discussed.

Stools of over 1,000 healthy people and contacts of cases of cholera have been examined by the "whole stool" method for the detection of carriers. A noteworthy fact is that the percentage of healthy people passing vibrios increases with the increased case incidence of cholera.

Thousands of flies have been examined and vibrios have been frequently isolated from them. The relationship of these findings to the case incidence of cholera and the carriers of the disease has been shown.

The influence of Absolute Humidity over the outbreaks of cholera in Hardwar has been determined.

Above 10,000 people were inoculated against cholera in Hardwar at the last Kumbh fair. The practicability of this measure in preventing outbreaks of cholera in the big fairs in the United Provinces has been discussed.

Measures suggested by the above research for the prevention of outbreaks of cholera in Hardwar are mentioned.

Introduction of underground sewage, with chlorination of the most dangerous part of the Ganges and the use of tap water of open wells may suffice to eradicate cholera from Hardwar.

**69.** On the History of Cholera Epidemic in Formosa since 1895.  
Dr. **Kiribayashi, S.** (*Formosa*).

**70.** De l'Agglutination des Vibrions Choleriques par le Serum des Bivaccines (methode Besredka). **Labernadie, V. G. F.**, Major (*Chef du Laboratoire de Pondichery Etablissements Francais dans l'Inde*).

Resultats de l'examine du sang des fonctionnaires vaccines depuis un an et plus contre le cholera par la methode de Besredka: prise de bile precedent l'absorption de vibrions choleriques tues par la chaleur (3 jours de suite a jeun).

**71.** Statistical Studies in the Epidemiology of Cholera. **Russell, A. J. H.**, Lt.-Col., C.B.E., M.A.; D.P.H., I.M.S. (*Director of Public Health, Madras Presidency*).

Introduction, historical—King's Cholera clock for Madras Presidency; the necessity for division of the Province into three separate areas; the association of cholera with climatic conditions.

If cholera epidemic have any association with climatic factors, then they must be periodic; seasonal prevalence; periodicity of cholera epidemics, illustrated by the periodogram method of Brownlee.

Analyses of the data over a long period of years permits of forecasting of epidemics; geographical distribution of the incidence of cholera.

Correlations obtained between incidence of cholera and the four climatic factors, rainfall, humidity, temperature and pressure, for which meteorological records are available; deductions from these correlations, both zero order and partial.

Influence of pilgrim centres and fairs and festivals on the spread and incidence of cholera illustrated from Madras Presidency—Importance of carriers.

**72.** Observations on the Bacteriology and Epidemiology of Cholera in the Asansol Mining Settlement. **Tomb, J. W.**, O.B.E., M.A., M.D., D.P.H. (*Medical Officer of Health, Asansol Mines Board of Health, Indian Research Fund Association Grant*) and **Maitra, G. C.**, Capt., I.M.S. (*Research Worker, School of Tropical Medicine and Hygiene, Mining Association Endowment*).

Introduction.

Non-agglutinating vibrios in surface waters derived from human pollution.

Description of "open bowl" method of cultivation of vibrios.

35 per cent. of the inhabitants of the Mining Settlement carriers of non-agglutinating vibrios.

Two bacteriological types of clinical cholera cases.

Agglutinability of vibrios not essential for the symptom-complex known as cholera.

Description of efforts to demonstrate the identity of agglutinating and non-agglutinating vibrios.

Natural conversion of agglutinating vibrios into non-agglutinating vibrios in survivors of epidemic cholera.

Natural conversion of agglutinating vibrios into non-agglutinating vibrios in contaminated water-supplies during epidemics.

Variability of cholera vibrio morphologically, etc., a well recognised phenomenon.

Non-agglutinating intestinal vibrios constitute the 'reservoir of cholera both epidemic and endemic.

The curve in the Asansol Mining Settlement of

(a) The vibronic contents of surface water-supplies.

(b) Absolute Humidity.

(c) Epidemic Cholera.

Factors on which the endemicity of cholera in any locality depends.

**73.** On the Action of the Serum of Cholera Convalescents on Comma Vibrios. **Ukil, A. C., M.B. (Cal.),** (*Professor of Bacteriology, National Medical Institute, and Physician for Infectious Diseases, Chittaranjan Hospital, Calcutta*).

Bacteriolytic and protective properties of the sera of 40 cases has been studied *in vitro* and *in vivo* at the laboratory. Their therapeutic application in cholera cases is still under trial.

## DYSENTERY, SPRUE AND INTESTINAL INFECTIONS.

**74.** The Treatment of Tropical Gastro-Intestinal Infections. **Choksy, N. H.,** Khan Bahadur, C.I.E., M.D. (Hon. Causa), Freiburg, i.Br., F.C.P.S., I.M. & S., Bombay (*Vice-President, College of Physicians and Surgeons, Bombay; Member, Bombay Medical Council; Late Medical Superintendent, Arthur Road and Maratha Plague Hospitals, Bombay, 1888—1921*).

Use of Mercuric Cyanide in acute gastro-enteritis of infants and children, food-poisoning and in cholera.

**75.** Recent Work on Sprue. **Mackie, F. P.,** Lt.-Col., O.B.E., I.M.S. and **Fairley, N. H.,** M.D. (*Haffkine Institute, Bombay*). (For abstract see p. 11).

**76.** Blood Transfusion in the Treatment of Sprue. Dr. **Manson-Bahr** (*London School of Hygiene and Tropical Medicine*).

**77.** On the Dysenteries in Bengal. **Ukil, A. C., M.B. (Cal.)** (*Professor of Bacteriology, National Medical Institute and Physician for Infectious Diseases, Chittaranjan Hospital, Calcutta*).

A classification has been made according to causation. Sources of data—(1) statistical, (2) laboratory examination of 1,500 samples of stools. Among other observations it has been shown that bacillary dysentery is commoner than amœbic dysentery and that some organisms of the Salmonella group play a large part in the causation of bacillary dysentery in Bengal. The results of an attempt to prove the rôle played by flies in the spread of dysentery in Calcutta by culturing the intestinal contents of flies during an epidemic have been given. The association of various intestinal flagellates in intestinal catarrh has been incidentally noticed.

## BACTERIOPHAGE.

**78. Bacteriophage and Bacteriophagy. D'Herelle, F.** (*Director of the Bacteriological Service; International Quarantine Council of Egypt*).

Bacteriophage is a "principle" which produces the dissolution of bacterial cells and reproduces itself in the course of this dissolving process. This principle is present in the intestine of every man and animal: in normal individuals it develops upon saprophytic intestinal bacteria. During recovery from a bacterial disease a bacteriophage principle, capable of dissolving the bacterial agent of the disease, is present in the intestine of the convalescent and even in certain organs.

During the last six years, several hundreds of papers have been published on the question of the nature of the bacteriophage. This question is a very important one, for it has a repercussion on the study of a whole series of phenomena which constitutes bacteriophagy *in vitro* and *in vivo*, i.e., the experimental phenomenon of bacteriophagy and the natural process of bacteriophagy which occurs in the body in the course of infectious diseases.

I have brought out a whole series of experiments (since confirmed by several authors), which show that the bacteriophage is composed of filter passing corpuscles; that these corpuscles are autonomous and possess their own properties, entirely independent from the bacteria at the expense of which they reproduce themselves; that these corpuscles possess the powers of assimilation and adaptation. Those various properties, autonomy, assimilation and adaptation, constituting the criteria of life, every being which possesses them is necessarily living "by definition."

The bacteriophage then is a filter passing parasite of bacteria, *Protobios bacteriophagus*, d'Herelle, 1918, and the phenomenon of bacteriophagy in reality is the result of an infectious disease that prevails amongst bacteria.

**79. Pathology and Epidemiology of Infectious Intestinal Diseases, in particular Cholera and Bacillary Dysentery. D'Herelle, F.** (*Director of the Bacteriological Service, International Quarantine Council of Egypt*).

In the infectious intestinal diseases of man and animals, the end result, recovery or death, is intimately associated with the behaviour of the intestinal bacteriophage.

In normal individuals, bacteriophage lives upon saprophytic intestinal bacteria. By a process of adaptation (experimentally demonstrable *in vitro*), which is more or less rapid according to surrounding circumstances, bacteriophage is able to parasitize any invading bacteria.

Experiments show that the patient invariably succumbs when the adaptation is lacking. In case of recovery, the improvement begins from time when the bacteriophage isolated from the stools of the patient is capable of producing complete bacteriophagy *in vitro*.

The importance of the behaviour of the bacteriophage upon the course of an epidemic is as great as it is upon the process of the recovery.

At the beginning of an epidemic there are disseminated into the environment the pathogenic bacteria; this is the period of the propagation of the disease. Then from the first convalescent, there are disseminated bacteriophages, which have acquired the power of killing and dissolving the pathogenic bacteria in his intestine. From this time more and more patients recover, bacteriophages become more and more disseminated and the epidemic declines, finally to cease when "contamination" by bacteriophage becomes general.

Recovery and immunity are contagious in the same way and by the same means as infectious disease itself.

**80. Bacteriophage as a Specific in the Treatment and Prophylaxis of Cholera and Bacillary Dysentery. D'Herelle, F.** (*Director of Bacteriological Service, International Quarantine Council of Egypt*).

In a preceding paper, I have pointed out that observations and experiments show that the behaviour of the bacteriophage is intimately related to the natural process of the recovery as well to the stopping of the epidemics. The best way to verify the truth of such a statement is to realize cross experiments, i.e., to reproduce both processes experimentally by employing cultures of bacteriophages.

In relation to bacillary dysentery, I treated in 1919 several cases of Shiga and Flexner dysenteries, giving 2 c.c. of a culture of a *potent* bacteriophage, to be taken by mouth. In every case all symptoms definitely disappeared within 24 hours, whatever the gravity might be. Since then bacteriophage treatment has been widely employed in Brazil and in the Sudan, where thousands of cases have been treated, and my first statement has been entirely confirmed.

I must strongly warn experimenters that cultures of *weak* bacteriophages are entirely useless for the purpose of treatment.

In the course of the present year, thanks to the Indian Research Fund Association, and with the collaboration of Major Malone, I.M.S. and Dr. Lahiri, I have been able to make extensive researches in relation to cholera. In the great majority of cases the result of the bacteriophage treatment in cholera has been fully efficient.

We have also tried the stopping of village epidemics by spreading over potent cholera bacteriophages into the environment. To that purpose we have added 50 c.c. of a selected bacteriophage culture in the wells supplying the infected area. The first results have been extremely promising. As the experiments are actually continuing, the statistics of both treatment and prophylaxis will be given in the paper presented at the Congress.

**81. The Therapeutic Use of Bacteriophage in Dysentery in Rangoon. Morison, J., Lt.-Col., I.M.S. (Pasteur Institute, Rangoon).**

## LEPROSY.

**82. Leper Settlement Development. Donaldson, R. S., M.B., Ch.B., D.T.M. (Medical Officer, Lady Willingdon Leper Settlement, Chingleput).**

**Introduction:**—The basis of this paper is experience gained in organising and developing the Lady Willingdon Leper Settlement, Chingleput. It offers a good field for the study of Leper Settlement, development and the use of such institutions for the study and treatment of leprosy. Founded in 1841 in Madras and latterly at Royapuram under the care of Government, the Asylum was transferred in April 1925 to an entirely new institution at Tirumani near Chingleput. The management was entrusted to the Madras Mission of the United Free Church of Scotland under a five years' agreement with the Secretary of State for India. The present European staff is a Superintendent, a Medical Officer, and a Matron.

**Lay-out:**—(This will be illustrated by eight lantern slides.)

The area is divided into three zones—clean, neutral and tainted. The staff residential quarters are in the clean zone. In the neutral zone are the administration blocks, viz., general and medical, and removed at a little distance are two Observation Blocks. The tainted zone is divided into two parts—male and female—separated by a compound wall. Along this wall are the common buildings, viz., Dispensary, Hospital, Boarding School and Recreation Hall. On the female side there are 13 separate blocks each with two rooms and having six patients. On the male side there are 58 similar blocks and four blocks for Anglo-Indian families.

**Population:**—The present accommodation is for 480. The present population is 348 adult males, and 86 adult females, 24 boys, and 19 girls. 80 per cent. are Hindus, 5 per cent. Mohammedans, and 15 per cent. Christians.

An undue proportion of the population is of the beggar type and this creates problems.

Patients are housed in the blocks according to their leper medical classification.

The population is unstable. Admissions and discharges are voluntary. Last year we had 916 admissions and 760 discharges. This militates against regular and continuous treatment.

At first, of the adult population only about 13 per cent. took treatment. Lately this number has increased and now we have 33 per cent. of the adult population on treatment. All children are under treatment.

Twenty-seven cases have become symptom free since taking over. Unfortunately very many cases leave us in the last stage of their treatment. In addition 13 have left during their period of observation.

**Exercise:**—This is vital for successful injection treatment. Every patient certified as being fit for it, is required to do two hours light manual work per day. This greatly aids the treatment. There is great reluctance on the part of the patients in carrying out this rule.

**Medical Records:**—All the patients are charted on outline diagrams showing the various lesions on admission and a history of each case is kept. Periodical recharting is carried out.

**Treatment:**—We started with Ethyl Esters of Hydnocarpus Oil and later changed to the pure oil. At present we are using both, and also trying the effect of Potassium Iodide.

"Avenyl" is being used for the treatment of associated syphilis in lepers. 55 per cent. of the population have positive bloods. The results are good.

The Khan Test is being employed for the detection of syphilis.

*Diet*:—Raw rations are issued and the patients do their own cooking. The present diet is based on a ration allowance of 24 ozs. of raw rice per head per day. There is under discussion a proposal to change this and institute a basic diet of:—

Rice, Ragi, Cholum, or Cumbu. (Patients to have choice)	..	..	..	..	18 ozs.
Dhall	..	..	..	..	6 "
Salt	..	..	..	..	$\frac{3}{4}$ "
Ghee	..	..	..	..	$\frac{1}{2}$ "
Tamarind	..	..	..	..	$\frac{1}{2}$ "
Curry Powder	..	..	..	..	$\frac{1}{4}$ "
Onions	..	..	..	..	$\frac{1}{2}$ "
Vegetables	..	..	..	..	8 "

This is for patients not under treatment. For patients under active treatment an extra quart of fresh cow's milk a day is proposed.

*Suggestions for future Settlements.*—

(a) Families ought not to be allowed to live together. Child bearing creates insoluble administrative problems and aggravates the disease.

With mixed establishments it is practically impossible to keep the one sex from the other.

Settlements ought to be for one sex only.

(b) Cases amenable to treatment and beggar cases of the burnt-out type ought not to be housed in the same Settlement. The sight of the badly deformed case repels and frightens the more amenable case.

There ought to be a separate Asylum for the burnt-out beggar type of leper.

(c) Children are very susceptible to the disease. If allowed to mingle freely with more infectious cases within the Settlement lightly infected children may become more heavily infected. It is important to stamp out leprosy from among the children.

All Settlements should have a spacious detached area for children only.

*General Suggestions*:—In tackling the leprosy problem it would aid greatly if institutions with these divisions were multiplied over the land. They could become the centres of geographical districts. Skin clinics could be established in the surrounding area to act as feeders for the treatment centre. It is most unsatisfactory to pick up the majority of your cases as casuals at the gate.

It might be considered whether it is not desirable to have some modification of the Leper Act whereby Lepers within the area actually covered by the Institution would be obliged to remain until they had permission to leave.

Such treatment centres could be used as Central Institutions where doctors and students could be trained in diagnosis and differential diagnosis. Should not every student passing through the Medical



Colleges be compelled to take a short course of lectures in Leprosy and have a prospect of at least one question on the subject in his final paper?

Research on the subject is very necessary and these Settlements would provide ideal material for research on the pathology and treatment of the disease. Such centres ought to be arranged, equipped, and staffed, definitely for this purpose.

**83.** La Lepre a Pondichery. **Goyon, J. de**, Lt.-Col., and **Labernadie, V. G. F.**, Major. (*From the Laboratoire de Pondichery, Etablissements français dans l'Inde*).

I. Statistique.

II. Traitement,

(a) ethers ethyliques de chaulmoogra

choc therapeutique, a symptomes cardio-pulmonaire.

accidents observes

crises aiguës generalisees.

zona thoracique.

(b) huile d'hydnocarpus creosotee (Muir) preparee a l'hôpital de Pondichery (Procédé Laffite).

Parfaitment toleree.

Active.

III. Prophylaxie—Reglementation.

**84.** Some Hæmatological Aspects of the Potassium Iodide Treatment of Leprosy. **Henderson, J. M.**, M.B., Ch.B. (*Working under the British Empire Leprosy Relief Association at the School of Tropical Medicine, Calcutta*).

In connection with the potassium iodide treatment of leprosy it was considered that an investigation into certain hæmatological and serological aspects of this treatment might prove of value.

The channels which have been explored so far are these: (1) the total and differential white blood cell counts; (2) the globulin content of the serum in patients under K. I. treatment; (3) the albumen content of the serum in patients under K. I. treatment; (4) the lipase content of the serum in patients under K. I. treatment; (5) the effect of varying concentrations of K. I. on serum *in vitro*; (6) the relationship between total white cell count, sedimentation rate and lipase content in patients under K. I. treatment.

The association of a marked leukocytosis with the reaction induced by K. I. as contrasted with the very slight alteration in the blood picture in reactions otherwise caused has been noted. The study of the relationship between sedimentation rate and total white cell count has brought to light some interesting facts regarding the association of these two phenomena.

Although the investigation is still in its early stages, sufficient of interest has already emerged to warrant its pursuit along these lines in an endeavour to ascertain if possible the intimate and peculiar nature of the action of K. I. on leprosy.

**85. Serologie de la Lepre. Labernadie, V. G. F., Major (Chef du Laboratoire de Pondichery, Etablissement francais dans l'Inde).**

I. Le Bordet Wassermann (Hecht Bauer) apres index hemolytique precis n'est pas chez les lepreux aussi frequemment positif qu'il l'a ete dit.

II. La reaction de Matefy (Deut. Med. Klin., No. 21, 1923) n'a pas plus de valeur pour le diagnostic de la lepre qu'elle a pour le diagnostic serologique de la tuberculose.

III. La reaction de Rubino (Soc. Argentine, Biologie, 7 Oct. 1926) n'est pas suffisamment sensible.

**86. The Iodide Treatment of Leprosy. Dr. Muir, E. (Indian Research Fund Association, School of Tropical Medicine and Hygiene, Calcutta).**

The principle of this treatment is to administer doses of potassium iodide orally beginning with small and gradually increasing to massive doses, the rate of increase being regulated according to the degree of reaction produced.

The power of potassium iodide to produce reactions in leprosy has been recognised by leprologists since the time of Danielson but the reaction has been mistaken for an increase or reactivation of the disease and potassium iodide has therefore been considered harmful. Experience now shows that the reaction (shown by swelling up and erythema of existing lesions, the appearance of rose-coloured nodules and a rise of temperature) is due to the breaking down of leprosy granuloma and, if the treatment be carried through steadily according to the tolerance of the patient, has been found invariably beneficial. Potassium iodide has the power to search out the disease and destroy it wherever lesions may exist in the body, whether in the skin, mucous membranes, lymph nodes or nerves. Excessive or prolonged reactions are easily controlled by other drugs, but these seldom occur except at the beginning of treatment in advanced cases. While the more vascular lesions clear up quickly, the more fibrous granulomata may resist even such large doses as 240 grains given twice a week for a considerable time. It is still too soon to say whether potassium iodide will be able to effect a complete cure, but there is reason to believe that its use is a distinct advance on other forms of treatment. It has the additional great advantage that it is given orally, and, if precautions are taken, produces practically no toxins or other inconvenient symptoms. It is therefore very suitable for the treatment of patients in villages where they have to travel a considerable distance for medical aid.

**87. Subsidiary Uses of Potassium Iodide in Leprosy. Dr. Muir, E. (Indian Research Fund Association), and Dr. Landeman, E. (From the School of Tropical Medicine and Hygiene, Calcutta).**

Not only is potassium iodide a useful therapeutic agent in leprosy, but its power to seek out foci of the slightest infection wherever it may exist in the body, cause lesions to swell up and destroy them, promises to make it a useful prophylactic against the development of the disease. Trials of its power in this direction are being made at the homes for the children of lepers at the Purulia Leper Institution. If

further trial confirms these results, it may be possible to sterilise those who have been brought up in contact with leprous relations or servants.

Another use of potassium iodide is to test those who have apparently lost all traces of leprosy through treatment with other drugs. In such cases comparatively small doses have *lit up* several isolated foci while subsequently much larger repeatedly given doses failed to produce any further reaction.

It may also prove useful as a preventive for those who work as attendant in leper institutions or who have to nurse or care for infectious cases.

**88.** The Sedimentation Test in Leprosy. Dr. **Muir, E.** (*Indian Research Fund Association, School of Tropical Medicine and Hygiene, Calcutta*).

The rate of sedimentation of erythrocytes in leprosy has been found by various writers to be accelerated especially in skin or nodular cases. Our observations confirm this, but also show that when *reaction* is produced in leprosy there is a rapid increase in the rate of sedimentation followed by as rapid a decrease as the reaction subsides.

The test forms a delicate indicator in the iodide treatment when other signs of reaction, such as fever and swelling up of lesions, are absent, especially in slight nerve cases or in skin cases which have healed up to the point at which febrile and local reactions are no longer produced by maximum doses but in which there is still a certain slight amount of leprous tissue being broken down by each dose.

**89.** Reaction in Leprosy and its Control by Antimony and other Metals and by Adrenalin. Dr. **Muir, E.** (*Indian Research Fund Association*.) (*From the School of Tropical Medicine, Calcutta*).

One of the most interesting and important phenomena in leprosy is *Reaction*. The exact causes of reaction have not yet been worked out, but it seems to be associated with the removal of the protective mechanism of lepra bacilli, bringing them into close contact with the tissues which consequently react to their contact. This process if carried out continuously and progressively as is possible by the use of potassium iodide is in our experience always beneficial.

Reaction is marked by swelling of lesions, rise of temperature and the appearance of evanescent rose-coloured nodules in the skin. In the nerves it is marked by swelling, tenderness and increased nerve signs such as anæsthesia. At the beginning of iodide treatment reactions are apt to be severe and to continue for some days. Small doses of antimony and other metals such as copper and mercury tend to limit these reactions. Later they continue only so long as the iodide has not been excreted (up to 48 hours) and then subside of themselves.

Painful reactions in nerves can generally be relieved by small injections of adrenaline.

Bacillæmia is caused by reactions but fresh, permanent lesions have not yet been observed in any case.

**90.** The Treatment and Prevention of Leprosy. Dr. **Muir, E.** (*Research Worker in Leprosy under the Indian Research Fund Association, School of Tropical Medicine and Hygiene, Calcutta*).

It cannot be claimed as yet that we have a "specific" for the treatment of leprosy, but this is no reason for adopting the despondent attitude taken up by many who declare that leprosy is incurable and refuse to use any remedies against it.

Wherever that the treatment of leprosy has been taken up seriously and intelligently large numbers of patients have lost all active signs of the disease and year by year the period is lengthening during which they have remained clinically well.

Apart from the personal relief that such patients experience it must be remembered that through their treatment and clinical recovery we are shutting off in the most effective way the main avenues of infection. If while practically nothing was being done to stamp out leprosy the disease was apparently at a standstill, neither increasing nor diminishing, surely the training of medical men in leprosy treatment and the general adoption of the most effective therapeutic measures must lead to marked diminution of its incidence.

It is a poor economy that refuses the half loaf because the whole loaf is not available and I think that we have certainly got the half loaf in the form of effective treatment giving good results in the large majority of cases, even though the whole loaf of a specific is still wanting.

The causal organism in leprosy appears to lie half way between ordinary bacteria and the mycelium producing actinomycetales. In consequence it may be attacked by means of vaccines with the object of causing immunity and also by means of chemotherapeutic remedies which have the effect of breaking up leproma and allowing the tissues of the body to destroy the bacilli.

At the same time, as in all other chronic diseases for which a specific is lacking, the condition of the body and its general resistance are of first-class importance and no line of treatment which neglects these factors is likely to be generally effective.

Of chemotherapeutic remedies the most generally adopted are the oils of the *Hydnocarpus-chaulmoogra* group and their preparations. The methods of administering these are many—oral, by inunction, by the subcutaneous, intramuscular and intravenous routes. After trying out all these we have found the intravenous injection of the sodium salt the most simple and effective and it certainly is the most popular with patients. This method of administration which was first adopted by Sir Leonard Rogers was given up because of the blocking of the veins which soon occurred, but a new method by which the patient's blood is mixed with a 2 per cent. solution of the salt in the syringe before injection has done away with this difficulty. This method of administration is practically painless, a very important matter when it is considered how long patients have to endure treatment.

Another mode of treatment is to inject the pure, sterile oil prepared from fresh seeds. When the oil is fresh and carefully prepared it is not painful to any marked degree and patients stand it well. Both the methods above mentioned are cheap, an advantage

which is not inconsiderable when large numbers of poor patients have to be treated.

The ethyl esters, generally given intramuscularly, have in our experience been found more painful but equally effective. They have the comparative disadvantage in a poor country like India of being more expensive.

Other drugs used in leprosy are some of the heavy metals, especially antimony and copper. Much of the benefit observed from their use is probably of the nature of limiting and clearing up reactions, although there are indications that some copper preparations may be very useful in the destruction of the disease.

Another drug which has a very important place in the treatment of leprosy is potassium iodide. Fear of the reactions caused by excessive initial doses has for long prevented this drug from being used effectively. I shall only refer to it shortly here as other papers dealing with its action have been prepared for this discussion.

All the drugs referred to above appear to have some action either on the bacillus itself, or what is more likely, on the leproma with the result that the protective mechanism of the bacillus is removed and it is phagocytosed and destroyed.

The second line of attack on Hansen's bacillus has been along the line of vaccines. These have been prepared either by grinding up and suspending lepromatous tissue or by making suspensions of various acid-fast organisms which from time to time have been supposed to be Hansen's bacillus under culture. Frequently valuable results have been obtained by the injection of such suspensions, but doubt exists whether this action is specific or of the nature of protein shock, as good results have also been obtained by injecting suspensions of tubercle bacilli, specially prepared, and even the injection of proteins such as milk and drugs like turpentine which cause the breaking down of proteins in the body have given equally good and sometimes even better results.

But when vaccine therapy is desired, in our experience the most effective form is the autovaccination caused by potassium iodide administered orally. The breaking down of leprous tissue, in some cases even by small doses of iodide, gives us a more effective and more easily administered and regulated form of vaccination than the injection of any vaccine.

Counter irritation of skin lesions is another auxiliary form of treatment which cannot be neglected. While we have found baths and friction in the sun beneficial we have obtained the best results by painting on a 1 in 3 solution of trichloroacetic acid.

As in all chronic diseases the general health of the patient must be maintained. The removal of accompanying and predisposing diseases, the regulation of diet, exercise, bowel and other sanitation, favourable hygienic and climatic conditions and, most important of all, a cheerful and hopeful mental outlook are details not one of which can be neglected in the fight against leprosy.

A very important point in the treatment of leprosy is the study of each individual case. Mass treatment will not give the best results. Frequently improvement is rendered impossible by some careless habit or indulgence of the patient and these must be sought out and corrected if possible.

With regard to the prevention of leprosy; while forcible segregation may be effective in certain small isolated areas with a paternal or autocratic government, such a method cannot be applied to India effectively except in a few cases.

Two of the great stumbling blocks in the way of dealing with leprosy have been its supposed special connection with the anger of the Gods and the supposition that it was irremediable. These have driven patients to hide their "taint" as long as possible and have depressed them mentally and physically, thus causing more rapid increase of the disease. The declaration that leprosy is remediable and the placing of the means of remedy within the reach of all by training doctors and organising treatment centres are likely to be the most effective means of prevention of leprosy in India. The fact that within 19 days of opening a treatment centre in a rural area in the Bankura district 250 patients suffering from leprosy were attending, and that once such a centre is opened and conducted by a suitable and well-trained doctor the patients continue to attend, though many of them have to walk 15 or 20 miles, is one of the best proofs that could be desired that leprosy is remediable.

For such centres we have found the iodide treatment the most effective and with this are combined small injections of hydnocarpus oil which render the treatment more active and please the patients who are disappointed if they do not get them.

One great advantage of such centres is their comparative inexpensiveness as compared with the foundation of asylums and colonies and they are a much more effective means of reaching early cases. They also serve as centres of propaganda and demonstrate the dangers of infection and the methods of avoiding it while patients as they recover prove to their associates the remediability of the disease.

**91.** The Propaganda-Treatment-Survey Centre as a means of dealing with Leprosy. Dr. **Muir, E.** (*Indian Research Fund Association, School of Tropical Medicine, Calcutta*).

The most conspicuous lepers are the beggars in large towns. But the lepers who spread the disease most are the parents, relatives and servants in private houses, and those who, though highly infectious, are not disfigured are therefore able to carry on their vocations without attracting attention. While many of these are found in large towns they are found in much larger numbers in the villages of certain districts.

The old method of dealing with leprosy was segregation in leper institutions. The new method is the P. T. S. Centre.

A highly endemic district is selected and one of the most leprous thanas is chosen. A dispensary for the treatment of leprosy is begun at the thana headquarters; villages are visited and lantern lectures given explaining about the disease. A confidential census is made from house

to house. These activities are carried on by a band of doctors who have been thoroughly trained in the diagnosis and treatment of leprosy. In one of the first thanas visited over 300 patients were attending after 18 days. About one month is spent in each thana. Village doctors noting the success of the treatment attend the clinics, learn the methods and carry them out in their own villages. When the survey doctors move on to a new thana a specially deputed District Board doctor, who has been trained during the month of survey, carries on the treatment. By starting 2 or 3 model centres in each district it is hoped to :

Ascertain the frequency of leprosy.

Ascertain the causes of high endemicity in certain areas as compared to others.

Teach the people how to diagnose and how to prevent the disease.

Demonstrate the method of treatment and its effectiveness.

Incite village doctors to study the disease and give them opportunities for doing so.

**92.** On the Creative Value of the Tubercle Bacillary Autolysate in Leprosy. **Row, R.,** M.D. (Lond.), D.Sc. (Lond.), O.B.E. (*From the F. D. Petit Laboratory, Bombay*).

A survey of the distribution of enzymes in nature and their purposive and specific properties in certain tissues and cells led the author to study the enzymes in tubercle bacillary cultures and of these the most prominent was found to be an endo-lipase, which acted autolytically in emulsions of young tubercle cultures grown on solid media. The result of such a digest gives rise to the production of (a) a mixture of fatty acids and (b) a bacillary residue now deprived of the acid-fast characters. The study of different products of the autolysis has led the author to attribute all the antigenic properties to this non-acid-fast material only, and a series of observations made on experimentally infected animals and clinically on patients subject to tubercle in different forms with this material as vaccine has led to the more extended study of the same not only as to the beneficial effects but also to the limitations of the same. A further investigation on the serums of the patients infected by tubercle and a comparison in allied acid-fast bacillary infection, viz., leprosy, gave a strong indication of the possibility of extending application of the vaccine with benefit in the latter disease and this paper records the results of such a vaccine therapy in a variety of leprosy cases and analysis of the same under the author's care as well as that of other independent observers and it also attempts to indicate the *modus operandi* of this autolysate.

**93.** Leprosy in Travancore. **Dr. Raman Tampi, K.** (*Inspecting Medical Officer, Travancore State*).

From the Travancore Census of 1921 it is evident that Leprosy exists to a large extent in the State. Out of a population of 4 millions there are 2,058 lepers. In 1911 the number of lepers was estimated to be only 1,115. This points to an enormous increase in the spread of the disease during the last decade. Even though such is the case, the report of the Indian Leper Commission makes no mention of Travancore. The

general public and medical experts outside our State are thus apt to think that the disease is not prevalent to such an extent as to call for effective measures to prevent its spread. In my opinion, the figures given are decidedly an under-estimate.

*Map of Travancore showing endemic areas and Administrative Divisions.*

At present there are three Hospitals in the State where lepers are housed and treated. Of these, one is a Government Institution with accommodation for 232 lepers. The other two are Missionary Institutions together accommodating about 100 lepers. Dispensary treatment is carried on in three centres in the Central Division where the incidence is greatest (62 per 10<sup>5</sup>).

There is no enforced segregation of lepers. They are frequently found begging in the streets. The lay public on the one hand have to be warned about the contagiousness of the disease. On the other hand it is time that lepers realised that treatment in the initial stages offers reasonable prospects of complete recovery.

*Distribution of Leprosy.*

In Travancore the smallest number is found in the High Range Division. Here the population consists mostly of estate coolies who are healthy adults under proper supervision. The sanitation of the District is also good. The elevation and the bracing atmosphere may also contribute to the low incidence of leprosy. Next comes the Southern Division. This has the least rainfall and the air is comparatively dry. There is hardly any leprosy in the extreme south where there is only 30 inches of rainfall per year and the air is very dry. The Leper Commission had also recognised that the leprosy incidence is in inverse ratio to the dryness of the climate. The Northern Division has greater rainfall and a greater leprosy incidence. The largest number of lepers are found in the Central Division. Here the climate is hot and moist and so favours the survival of the lepra bacillus outside the body as Rogers has suggested. Besides sanitation is also unsatisfactory. There are large areas of sandy tracts in this division which become water-logged and harbour larvæ of mosquitoes. In Travancore leprosy and elephantiasis flourish side by side in such sandy tracts and it will be useful to investigate if Culicidæ have any part in the transmission of leprosy also.

*Factors favourable for spreading Leprosy.*

1. Poverty with its results—overcrowding, defective sanitation and deficient diet.
2. Close association with lepers (Illustrative Cases).
3. Ignorance of the contagiousness of the Disease.

*Ætiology.*—The Leper Commission said that "Leprosy cannot be considered a hereditary disease and that there is no inherited specific predisposition to the disease by the offspring of leprosy patients." Later writers like Muir and Rogers have also come to the same conclusion. In cases where leprosy has occurred in several members of a family, close contact for long periods is quite sufficient to cause infection.



Bacilli escape from lepers in various ways (Rogers).

- (i) In nasal discharge when there is ulceration.
- (ii) From ulcers.
- (iii) In stools.
- (iv) In milk and semen.

### *Predisposing Causes.*

I. *Climate*.—Hot and moist, climate favours leprosy. In Central Travancore where the infection is very heavy, rainfall is over 100 inches.

II. *Age*.—Statistics from State Hospitals give maximal incidence between 20 and 40. This agrees with Rogers' figures.

III. *Caste*.—Largest number found among Hindu coolies. Higher castes are not exempt.

IV. *Sex*.—The disease here as elsewhere attacks males more than females.

### *Other Causes.*

I. Diseases lowering vitality, e.g., Malaria and Syphilis.

II. Diseases of Gastro-intestinal tract and intestinal parasites.

Both I and II are very common here.

III. Debilitating diseases, e.g., Influenza, Typhoid.

IV. Starvation.

Snake bite, rat bite and spider bite. 32.45 per cent. of local hospital cases give above history.

The following predisposing causes suggested by Ayurvedic Physicians deserve consideration.

1. Eating Antagonistic foods, e.g., milk and fish (especially prawns).

2. Over eating.

*Period of incubation*.—2 months to 2 years. Average 2 to 4 years.

*Varieties*.—(1) Skin. (2) Nerve. (3) Mixed. In Travancore nerve leprosy is the commonest, 56.84 per cent.

*Diagnosis*.—Cardinal points are anæsthesia to light touch and finding lepra bacilli. Besides these, thickening of nerves, want of sweating in special areas of skin and repeated febrile attacks may also be suspicious signs.

*Prognosis*.—Unfavourable as regards life, Trinidad observations are 6½ years for skin, 10 years for nerves and 9½ years for mixed. Some nerve cases may live to 20 years.

### *Conditions influencing Prognosis.*

1. Stage of disease. If treated early, prognosis very good.

2. Removal of exciting and favouring cause improves prognosis.

3. Natural body resistance and individuality of the patient favourable.

4. Dry temperate climate best.

5. Age. Leprosy less after 30.

6. Chronicity of disease. Prognosis good if not progressing rapidly.

### Treatment.

#### I. Improve diet and sanitary conditions.

*Medical treatment*, no specific.

Treatment can be considered under three heads\* (McLeod):

(i) *Metallic Preparations*.—E.g., Arsenic, Antimony and Mercury. I tried Collosol Antimony in a few cases. Results poor. No personal experience of As. and Hg.

(ii) *Sera and Vaccines*.—Sera not successful.

*Vaccines*—non-specific, e.g., Typhoid and B. Pyocyaneus reported to show improvement. Improvement due to protein shock (Sequeira).

*Nastin*.—I noticed slight improvement in anæsthetic cases.

(iii) *Vegetable Oils and their derivatives*.—Foremost is Chaulmoogra Oil from *Taraktogenos Kurzii*. The tree grows luxuriantly in areas in Travancore where leprosy is endemic—probably cultivated from early times as the oil had reputation for curing the diseases. Seeds when dry can be chewed and eaten, starting with one-third seed thrice daily to one thrice daily. Taste is not bad. I have seen improvement by eating seeds. In villages patients are taking these nuts. Dr. Traverse has advocated the powdered nut with *Cannabis Indica* to prevent vomiting. I find if given in small doses, there won't be vomiting. Cochrane had best results with *Hydnocarpus* Oil with 4 per cent. Creosote. This was tried in two hospitals here with marked improvement in anæsthetic cases.

*Moogrol*.—I have found this very useful in nerve cases. Both E. C. C. O. and E. T. O. were tried in State Hospital.

*Results of treatment for four years*.—E. C. C. O.—384 patients received injection, 5 discharged cured, 127 improved.

E. T. O.—559 treated. 14 absolutely free of symptoms, 193 improved considerably.

I have been trying a mixture (Sulphur and Damar Oil with 1 in 3 Chaulmoogra) in doses of 3 to 15 mms. Patients get relief as regards pains, and muscular twitchings. Colour of skin patches also show improvement.

I have also tried Sulphur Balsam (Sulphur and Damar Oil) dissolved in 1 in 7 of cocoanut oil. This has given excellent results in leprotic ulcers.

The following is the system of treatment generally adopted by Ayurvedic Physicians in the State who have under their treatment more than half the total cases.

As a preliminary, they give emetics and purgatives. This is followed by—

- |  |   |  |
|--|---|--|
| <ol style="list-style-type: none"> <li>1. Chaulmoogra</li> <li>2. Marking Nut Oil</li> <li>3. Margosa</li> <li>4. Oil extracted from Python.</li> <li>5. Cupping for patches in skin.</li> <li>6. Venesection for advanced cases.</li> </ol> | } | Used both internally and externally rubbing oils and exposing to sunlight. |
|--|---|--|

**Conclusion.**—Central Travancore offers an excellent field for observation and research in leprosy. The occurrence of Elephantiasis and Leprosy. Simultaneously in this area requires investigation.

## TUBERCULOSIS.

**94.** Exposition of a study of Dr. Leger of Paris on the Tuberculo-reaction de Vernes. **Labernadie, V. G. F.,** Major (*Directeur du Laboratoire de Pondicherry, Etablissements francais dans l'Inde*).

**95.** Incidence and Types of Tuberculosis met with in Bengal. **Ukil, A. C.,** M.B. (Cal.) (*Professor of Bacteriology, National Medical Institute and Physician for Infectious Diseases, Chittaranjan Hospital, Calcutta*).

The cuti-reaction of tuberculosis in urban and rural areas in Bengal. The results of cuti-reaction have been arranged according to age, sex, class and profession. It has been shown that the number of people giving positive Von Pirquet reaction is much fewer in both urban and rural areas in Bengal than in any part of Europe or America. It has further been shown that the incidence is higher in females than in males of the same age and that rural people begin to show positive reactions only after a stay of 2-3 years in heavily contaminated urban areas, like Calcutta, Chinsurah, Naihati or Chandernagore.

Types of tuberculosis met with in Bengal. An attempt has been made to determine the incidence of glandular, bone, lung and other forms of tuberculosis from hospital statistics, radiographs, post-mortem data, histological evidence and cultures.

**96.** Prevention of Tuberculosis in India. **Ukil, A. C.,** M.B. (Cal.) (*Professor of Bacteriology, National Medical Institute and Physician for Infectious Diseases, Chittaranjan Hospital, Calcutta*).

The possibilities of employing B.C.G. Vaccine in protection against tuberculosis in Bengal. The innocuousness of the strain, obtained from Prof. Calmette of the Pasteur Institute, Paris, has been determined on guinea-pigs. The applicability of the vaccine has been suggested in two classes of cases besides newly born infants:

(a) Children and adults in tuberculous families who show a negative cuti-reaction twice when done at an interval of 8 days.

(b) Delicate people, especially with impaired digestion and bad physique, who are found suitable by the above test, when they come to live in big towns.

Prevention of tuberculosis in India. The distribution and causes of the spread of the disease have been pointed out. Preventive measures suitable to Indian conditions have been suggested.

**97.** The *Cryptococcus*. **Banerjee, K.,** M.B., D.T.M. (*Assistant Professor of Pathology, School of Tropical Medicine and Hygiene, Calcutta*).

Many yeast-like parasites have been isolated from time to time by different workers and cultivated on suitable media. The multiplication

by budding has been observed. Most of these have been classified as "monilia," and no further studies made of their morphology.

The cryptococcus was first cultivated by Kutzinger in the year 1833, and their classification has been taken from Castellani. This particular "yeast body" was obtained from a case of dermatitis, and cultivated from similar cases on 4 occasions, and always in pure culture. Hitherto the causative agent was considered to be a cryptococcus and if cultured, a monilia or an endomyces.

The nature of the lesion—A circumscribed bright pink areola (seen best in fair skin) in the centre of which is a white pearly vesicular eruption—not very painful. Direct smear on slide shows the typical double contoured spherical or ovoid parent cell and usually one small bud. Mycelia not seen in tissues—These cases are similar to those described by Smith as due to prickly heat and caused by monilia.

Cultivation: aerobe. Grows on all media, vigorous growth on saccharose agar, Sabouraud's media, hæmolytic on blood agar, on McConkey's plate lactose fermenter, opaque, good deal of inhibition by bile salt.

High salt content of media above 2.0 per cent. inhibition.

Reaction of media on the alkaline side pH 9 and 10—inhibition.

Optimum between 6 and 7.

Staphylococci inhibits the growth to a marked extent.

Urea does not inhibit the growth.

Sugar reaction:—

Anærobe.

Morphological changes noticed only in fluid media with plenty of nutrition. Earliest appearance of septate mycelial elements about 9th day onwards in Raulin's media. From the 3rd week we see the typical endomycetic appearance with long septate mycelia and nodal germinules; there is never any dichotomy. Refractile plant volutin in the mycelia.

The transition observed from day to day in hanging drop preparations made from drops out of inoculated Raulin's media. If put up with saccharose saline the early formation of mycelia seen in 7—8 hours. The end organs are spherical or ovoid and rich in volutin: these break off and form further mycelial elements.

When nutrition is exhausted in about 8 weeks—ascoïeres begin to appear. They consist of fairly thick double contoured outer shell containing 4 asci. Ascoïeres are broken off from the mycelia, the outer shell ruptures liberating the asci. second generation. The behaviour is typically that of endomyces tropicalis described by Colonel H. W. Acton in the *Indian Journal of Medical Research*, 1918-19 obtained from the throat.

It is noticeable that this particular species always attacks people in a low and run down condition of health. The first three cases were all diabetics, the fourth case was one of sprue.

Animals have not been successfully inoculated: in rabbits gives rise to dry punched out sore at the side of inoculation; cryptococci have not been recovered.

**98.** The Streptococci and their Importance in the Treatment of Tropical Diseases. **Banerjee, K., M.B., D.T.M.** (*Assistant Professor of Pathology, School of Tropical Medicine and Hygiene, Calcutta*).

A very vast group consisting of no less than 40 varieties: only few have been completely worked out.

It is noticeable that streptococci causing rheumatic and scarlet fevers and purpura are practically unknown. The incidence of puerperal or empyema streptococci is practically the same as in the temperate climate.

The commonest streptococci met with:

(i) Surface of the skin. Impetigo, superficial, no scars; deep type, scars.

Secondary infection on Tinea and Seborrhoeic dermatitis. Induration and oozing of serum—no scars on healing.

In all cases the local symptoms are more prominent, general symptoms—slight.

(ii) Subcuticular and deeper tissues.

Lymphangitis. Filarial and so-called idiopathic erythematous rashes with high fever.

Deep abscesses sometimes along with staphylococci. Filarial and so-called idiopathic.

In these cases marked general symptom is the rule.

(iii) In the intestinal tract.

(a) Pyorrhoea and tonsillitis. Embolism, neuritis and joint-pains.

(b) Gastric and duodenal ulcer, secondary infection, hæmolytic toxin absorbed, anæmia and fever.

(c) Dysenteric ulcers, secondary infection by streptococci alone or along with other intestinal organisms. Embolism may catch the joints or large nerve trunk like the sciatic.

(iv) In the urine. Pernicious anæmia: Idiopathic Mechanism; may be caused by

(a) Breaches in the surface mucous membrane, diarrhoea and ulceration.

(b) Lowered internal defence mechanism, increased tissue permeability, leak of intestinal group of streptococci.

Types isolated are mostly of the intestinal group and fainty hæmolytic with short chains. They are comparatively more "delicate" than the other streptococci isolated from the skin, teeth, etc. They die after about the 5th or 6th subculture.

Experiment on perfused kidney. B. typhosus selected because it is easy to identify.

Kidney of a cat exposed and perfused with sterile normal saline through the renal artery. Circulation maintained by means of Higginson's syringe: effluent returned by the veins.

B. typhosus—young broth culture—is injected into the artery via perfusing fluid. B. typhosus recovered from vein but none from the urine flowing from the ureter. B. typhosus does not pass through a healthy Glomerular epithelium even if the pressure is raised moderately high.

Experiment repeated after the animal has been given

(1) Beriberi rice base.

(2) Cholera amines.

Conclusion.

**99.** A Comparative Study on *Leptospiræ*. Dr. **Inada, R.** (*Prof. of the Tokyo Imperial University, Physician*).

The author will present the results of the investigation made in his laboratory on the biological differentiation of *leptospira icterohæmorrhagiæ*, *hebdomadis* A and B types, *icteroides*, *febrilis*, and *water-leptospira*.

On the resistance of the *leptospiræ* against various external influences, Dr. S. Anjo studied the oligodynamic action of metals and the symbiosis with other bacteria, the resistance against saponine, bile, bile acid salt, organic and inorganic acid with the following results. The pathogenic and *water-leptospiræ* are different in their resistance in relation to the oligodynamic action and the symbiosis with other bacteria. The resistance of pathogenic *leptospira* is weaker than that of *water-leptospira*. Thus the pathogenic *leptospiræ* are divided into two groups. The one, to which the *L. icterohæmorrhagiæ* and *icteroides* belong, is weakest in its resistance. The other, to which *L. hebdomadis* A and B types and *febrilis* belong, is stronger in resistance than the former, although it is weaker than the *water-leptospira*.

For the immunological study Dr. S. Shiwozawa took up various sources of *leptospiræ* as follows: agglutination tests, culture in the immune serum, Pfeiffer's phenomena, the protection tests with immune serum and the protection tests with active immunization. The immunological differences of *L. icterohæmorrhagiæ* and *hebdomadis* will not be mentioned here, as it was already reported in the last congress. The author could find no noticeable difference between *L. icterohæmorrhagiæ* and *icteroides*. The foregoing results of the oligodynamic action on them seems to coincide with this result. *L. febrilis* is able to agglutinate with the immune sera of *L. icterohæmorrhagiæ* and *icteroides*, even if in lesser degree of dilution, and the immune serum of *L. febrilis* can agglutinate *L. icterohæmorrhagiæ* and *icteroides*. In the protection tests with the active immunization the author could not differentiate *L. febrilis* from *L. icterohæmorrhagiæ* and *icteroides*. From the standpoint of oligodynamic phenomenon *L. febrilis* seems to belong to the group of *L. hebdomadis*, while it belongs to the *L. icterohæmorrhagiæ* from the immunological findings.

**100.** Colour Variations in the Fungus of Dhobie's Itch (*Epidermophyton cruris*). **McGuire, C.**, Dr., L.T.M., D.T.M. (Bengal) (*School of Tropical Medicine and Hygiene, Calcutta*).

*Method of Cultivation.*—Scales are taken from the growing edge of the lesion, as mycelia are very numerous in this situation. When vesicles are present, the top of the vesicle is cut off and then used for cultivation. Various measures were used to get rid of contaminating organisms, staphylococci, yeasts and spore forming bacilli, as these organisms grew more rapidly and hindered the growth of the fungus.

The methods we tried were, (1) drying the scales for 8 days, (2) exposure to sunlight, and (3) soaking for 10 minutes in Absolute alcohol. The last method was the best. Lately we have been using .04% Gentian violet to hinder the growth of the staphylococci.

*Variations in the growth of the Epidermophyton.*—Up to date we have obtained nine variations in the growth of the fungus on Sabouraud's test media. The variations are best seen in primary cultures and consist of differences in the colour of the growth from yellow through orange to deep red. Besides these variations in colour there are differences in the downiness (pleomorphism), in the waves of the growth (concentric rings), and in the number and extensions of the radial furrows which may be constricted to the centre or extend for some distance. These primary cultures when planted on a test media, such as Sabouraud's maltose, glucose, saccharose, ordinary agar. Dorset's egg media and carrot grew in sub-cultures without any variations so that we could distinguish a culture which had a yellow culture from a pink or red one.

On a synthetic medium which we devised where we used, saccharose and the amino-acids, arginine nitrate and Tryptophane, all these cultures were similar in appearance.

*The morphology of the fungus.*—This was studied by hanging drop preparations to study the hyphæ; scraping the ærial hyphæ off to examine the surface runners, and cutting sections of the agar to show the deep roots. This study showed that these fungi were identical in their morphology, as they consisted of segmented and non-segmented roots which penetrate down into the media, which when viewed from the side had the appearance of a jelly fish.

The ærial hyphæ carried segmented spindles (Fusæux), grouped and single spores (conidia) and curled mycelium, similar to the spindles of creepers.

The conclusion that we came to is that the *Epidermophyton cruris* is a single species and that these variations in colour, etc., are purely due to the differences in the culture media and not due to a non-variant character of the fungus.

**101.** Note on the Preparation of Mutton Broth with Papain. **Martin, C. de C.**, Major, I.M.S. (*Pasteur Institute, Rangoon*). (For abstract see p. 141).

**102.** Sur le Commensalisme de la fauna Spirochætique dans les Arcades Dentaire et dans l'Intestine de l'Homme et des Animaux. **De Mello, I. Froilano**, Col. (*Director General, Medical Services, in Portugese India*).

Le rôle des spirochètes dans le tube digestif de l'homme n'est pas suffisamment éclairci. A côté de ceux qui les considèrent des organismes saprophytes il y a des auteurs qui leur attribuent certains états morbides qui seraient dus à une action pathogène, essentielle ou accidentelle.

Si les opinions sont discordantes sur ce point, elles ne le sont moins en ce qui concerne la nomenclature et l'identification des espèces.

Etudiant les spirochètes des arcades dentaires humaines, et en vue de l'impossibilité de cultiver ces espèces ou, au moins, de les obtenir en

culture pure parmi les différentes races ou variétés qui s'y trouvent, l'auteur emploie pour leur identification des méthodes purement morphologiques comprenant: (a) détails de cytologie et structure par les coloration générales et par fixation humide; (b) largeur; (c) longueur et nombre de spires, marqués au moins sur cent spirochètes dissinés à chambre claire; (d) rapport entre la moyenne des longueurs et la moyenne du nombre des spires, les moyennes étant prises sur tous les spirochètes dessinés.

On montre la fréquence du parasitisme des arcades dentaires humaines à l'Inde Portugaise dans les bouches normales et pyrrhéiques, et selon les ages, sexes, et races. On donne les dimensions de 4 type humains à l'Inde et à Angola; respectivement *Buccalis*, *Dentium*, *Intermedium* (qui est différent de l'*Intermedium* de Dobell) et une *Var.* plus mince du *Buccalis* qui est fréquente à Angola.

Étudiant ensuite les arcades dentaires de quelques animaux domestiques, on voit que le cheval, le porc, le bœuf, le chien hébergent des spirochètes qui sont minutieusement étudiés et se montrent tout à fait semblables aux spirochètes humains. Les animaux parasités ne présentaient aucune alteration morbide, ni générale, ni locale. Les rats, souris, chèvres et moutons n'ont pas montré des spirochètes dans leurs arcades dentaires.

Les spirochètes de l'intestin humain, étudiés à l'Inde Portugaise appartiennent à 4 types: (a) une large et courte espèce, trouvée une fois, semblable à des organisme similaires que l'on rencontre dans l'intestin des crapauds appelée *S. macfiei* 1917; (b) un vibrio-spirochète, trouvé aussi une fois, *S. couceiri* 1920; (c) des spirochètes buccaux qui gardent dans l'intestin leurs caractères inaltérés (cette constatation doit être bien présente à l'esprit pour que l'on soit prudent en ce qui concerne l'identification des especes coprozoïques soidisant nouvelles, en ayant le soin de les comparer toujours à ses congeneres buccales chez le même individu, homme ou animal; (d) *Sp. eurygyrata* Werner emend Fantham.

Les caractères de ces spirochètes ainsi que des espèces du type *Eurygyrata* rencontrées aux Indes et à Angola chez le cheval, mouton, souris manches, chèvres, bœuf, chien, rats, lapin, cobaye, mule, chat, sont signalés.

Les conclusions sont: similarité de la faune spirochètique, respective des arcades dentaires et de l'intestin de l'homme et des animaux; rôle probable de simple commensalisme en vue de l'ubiquité de ces espèces dont la présence et abondance est indépendante de toute altération morbide.

**103.** The *Malassezia* of the Skin, their Cultivation, Morphology and Species. **Punja, G.**, M.B. (*Assistant Professor of Bacteriology, School of Tropical Medicine and Hygiene, Calcutta*).

The genus *Malassezia* includes organisms of yeast-like forms, dividing by budding and forming mycelia either few or numerous broken into separate segments and bearing hyphæ which carry round or oval conidia, either solitary or in grape-like masses. There are no asci. and no lateral buds.



Three species are known:

- (a) *Malassezia ovale*—which gives rise to dandruff, alopecia, seborrhoeic dermatitis, one of the commonest skin diseases.
- (b) *Malassezia furfur*—which causes *Tinea versicolor*.
- (c) *Malassezia tropica*—the cause of *Tinea flava*.

The genera *Pityrosporum* of Sabouraud 1895 and *Malassezia* of Baillon 1889 are included into one—namely *Malassezia*, as the genus *malassezia* was first created and the identity of the two has now been established.

Various attempts at cultivation of the above species failed owing to the preponderance of secondary invaders—namely staphylococci and fungi. Egg medium with gentian violet 0.04% and absence of moisture have been found to be the most suitable for primary cultivation.

Morphology, characters of primary and secondary cultures on several media, various factors of growth and biological reactions have all been studied.

**104.** Actinomycosis Hominis. Dr. **Sur, Taraknath** (*Medical College, Calcutta*).

**105.** On the Anaerobic Bacteriologic Flora of certain cases of Cellulitis and Gangrene (including Diabetic Gangrene). **Ukil, A. C.**, M.B. (Cal.) (*Professor of Bacteriology, National Medical Institute, and Physician for Infectious Diseases, Chittaranjan Hospital, Calcutta*).

Incidence.

Bacterial flora studied.

Some of the lines of investigation that have been suggested.

## MALARIA

**106.** The Action of Quinine on the Malarial Parasites. **Acton, H. W.**, Lieut.-Col., I.M.S. (*Professor of Bacteriology and Pathology*) and **Chopra, R. N.**, Major, M.A., M.D. (Cantab.), I.M.S. (*Professor of Pharmacology*) (*School of Tropical Medicine and Hygiene, Calcutta*).

In 1921 King and Acton showed that even when a large dose of 1 gramme of anhydrous quinine base was taken by the mouth, the concentration in the circulating blood did not attain a stronger solution than 1—120,000. In 1922 Acton found that quinine in acid and alkaline substrates behaved quite differently on the paramœcium caudatum, thus quinine base was ten times more powerful at a pH of 8 than at a pH of 6. Sinton has confirmed this action clinically, and thought that the enhanced action was produced by reducing the temporary acidosis of the blood. Our experiments were conducted on the following lines.

(a) We have showed that by increasing the degree of alkalinity in the intestines, there was a greater diffusion of quinine into the circulating blood, and so the concentration was higher when alkalies were administered with the quinine.

(b) The concentration of quinine was greater in the mesenteric vessels than in the circulating blood. Hence explaining the high cure

rate of quinine in M.T. infections, as the main site of sporulation coincides with the maximum concentration of quinine in the blood.

As the concentration of quinine in the circulating blood never attains to that strength which will kill every parasite with a single dose or injection the drug has to be given over fairly long periods, so that there is a partial destruction occurring with each cycle. Moreover we know from clinical experience that if the parasites have matured for some hours, quinine fails to prevent the next attack. Therefore it was necessary for us to study the effects of sublethal concentration of quinine on protozoal forms of life:—

(a) On *Paramecium caudatum*, we found that if the lethal concentration was 1—100,000 at a pH of 8, that below this concentration a few survived and did not reproduce or reproduced so slowly so that at a concentration of 1—250,000 only a few individuals were seen at the end of 10 days.

(b) That quinine in low concentration first paralyses and interferes with the movements of these protozoa, before it actually kills. It is probably on the youngest and most active trophozoites that this action is best seen.

We consider that the concentration attained in the circulating blood is insufficient to directly kill the malarial parasites. In sublethal concentrations it paralyses the movements to a certain extent, and so the parasites fail to penetrate the envelope of the red blood cell and get to its food. These sluggish parasites are soon swept off the face of the red blood cells by the friction of the blood stream and die of starvation. In malignant tertian infections when the young trophozoites are extremely active and adhering to the red blood, whilst sporulation mainly occurs in the mesenteric vessels where the concentration of quinine is at its maximum, the cure rate is therefore higher in this infection. The parasites appear to be caught up in the splenic reticulum, and destroyed not by leucocytes but by cytolsins (Acton and Knowles 1925).

**107.** A Note on some Experimental Attempts to Transmit Malaria Organisms through Mosquito Biting Experimentally. Dr. **Bruce-Mayne** (*Malariologist, Central Malaria Organisation, Kasauli*).

Anopheline and non-anopheline mosquitoes were used in 12 experiments in biting patients with numerous benign tertian rings and gametocytes, the feeding interrupted within one minute and the blood meal completed on new hosts to determine the possibility of mechanical transmission.

Eight experiments were conducted with *Aedes thibaulti* using from 2-15 specimens in each case, and four experiments with *Anopheles quadrimaculatus* using 3-40 specimens of mosquitoes.

The latter attempts were controlled in two successful inoculations of volunteers, applying one mosquito and five mosquitoes, respectively, 18 days after the insects acquired an infective blood meal. Dissections of mosquitoes incubated for 12-20 days showed oocysts and sporozoites in 35 per cent. of the specimens examined.

These negative attempts recall previous results of experiments in the conveyance of sporozoites in which single anopheline mosquitoes applied for as short a period as 15 seconds to one minute proved infective to three volunteers.

This note is suggestive of the desirability of further work on the question of the determination of the minimum dose of material, either blood or mosquito, containing plasmodia required to produce malarial fever.

**108.** The Initial Seasonal Appearance of Malaria in a Selected Area in India, demonstrated by the presence of Parasites in the Insect Carrier. Dr. **Bruce-Mayne** (*Malariologist, Central Malaria Organisation, Kasauli*).

An attempt to answer the query: "When do mosquitoes first appear infected in nature. Can the mosquito be used as an indicator of prophylaxis under conditions obtaining in India?"

The study was confined to the District of Saltanapur in the United Provinces, India.

Presence of endemic malaria as revealed by (1) a spleen index of children in three villages of the District, (2) blood examinations made at random during the period of the investigation. Types of plasmodia observed.

Examination of anopheline mosquitoes to detect specific organisms.

Dissections as to species by weekly operations during the period March-August.

Total number of mosquitoes dissected and dates of appearance of plasmodia in gut and glands.

Practical application.

Short Bibliography.

**109.** *A Summary of what is known of the Significance of the Spleen Rate and Average Size of the enlarged Spleen in Malaria.* **Christophers, S. R.** (Director, Central Research Institute, Kasauli).

The secret of the spleen rate. Why does the average size of the enlarged spleen increase with an increase in the spleen rate and why is there a minimum value for the average enlarged spleen. Theory of chance distribution of infections to explain this. Recent use of a technique for more careful measurement of the spleen and results following the application of such technique. There are 3 types of spleen each of a certain given size with the usual biometrical frequency distribution departures, these are (a) the normal spleen, (b) the spleen of acute infestation, (c) the spleen of immune infestation. The average spleen as encountered in most communities (hyperendemic) is a complex due to mixture of these three types and their departures in measurement as seen in different ages of children and in children of different residential periods constituting the community. In selected circumstances the two types of enlarged spleen can be sometimes seen in an unmixed state. The same occurs with the adult

spleen (Coyell). The size of the spleen need not therefore necessarily be a mere function of the spleen rate but may be dependent on various epidemiological circumstances and this opens up the whole question of the study of the spleen rate from a new standpoint.

Some misconceptions referred to. Technique of accurate measurement has a definite object and is not thoughtless over elaboration in that it is designed for use in the investigation of the nature of the spleen rate which, being a measure very largely used by malariologists, is worthy of close study. The cruder methods may serve to record size but it is doubtful if there is any value in such record since variations in the average spleen are too small to be detected with certainty by such methods. Variation in the position of points used for measurement is a difficulty so far unavoidable, but it is necessary to be clear as to the error in individual measurements due to this cause and that of *means* with which we are always dealing and on which results are based. There is great need for further study including the anatomical relationships of the enlarged organ, a subject as yet entirely untouched. The whole matter has great importance in view of the extensive use now made of the spleen rate in mapping malaria—what are we measuring—clearly *endemicty*, but what is *endemicty*—and what use do we now make of the size of the spleen in this connection.

**110. Why do *Anopheles* Larvæ feed at the Surface and How?**  
**Christophers, S. R. and Puri, I. M.** (From the Central Research Institute, Kasauli). The anopheles larva is clearly morphologically adapted to feed at the surface (ability to rotate head 180°, palmate hairs, etc.). The reasons why this adaptation should be worth while have been studied. It may be worth while (a) because most waters have a special surface film, *bacterial and flagellate* film, (b) because there is a tendency for many organisms to collect in greater numbers beneath the surface film, either purposely or because they are lighter than water—this, the *sub-surface layer* is that normally tapped by the larva for its food, (c) the mechanics of the feeding appears to be greatly facilitated. The surface bacterial film can be readily studied by a simple technique—most waters have such a film which may be (a) harmless or beneficial, (b) harmful, thus accounting for some unsuitable waters. In feeding the larva creates a shallow superficial layer of intake water carrying with it sub-surface layer food material: normal or *free feeding*. The larva may adopt *film feeding*, in which case the brushes, etc., are differently used. When free feeding the issuing stream is a narrow powerful current, like the Gulf Stream issuing from the Gulf of Mexico, which passes out, reflected by the mandibles, at right angles from either side of the head. It is not seen unless special methods are taken to demonstrate it because the issuing water has been freed from all particles by the maxillæ and it is therefore invisible. The nature of the feeding process is described. Certain matter (e.g., lycopodium spores) in the sub-surface layer may by mechanical insult prevent the feeding of the larva. Larvæ appear to thrive best on a mixture of bacteria with alga; on either alone they may not thrive.

**111.** Malaria Outbreak in the Off-Season. **Clemesha, W. W.**, Lieut.-Col., I.M.S. (*Director, Malaria Control Scheme, Bandarwela, Ceylon*).

**112.** Measurement of the Enlarged Spleen in Adults. **Covell, G.**, Major, M.D., I.M.S. (*Assistant Director, Central Malaria Organisation, Kasauli*).

The results obtained from the measurement of the position of the apex of the enlarged spleens of 825 adults are detailed.

Emphasis is laid on the practical value of accurate measurement of the spleen in conjunction with parasite counts as a means of estimating the amount of malaria in a community.

**113.** The Theory and Practice of Malaria Control. **Gill, C. A.**, Lieut.-Col., I.M.S. (*Assistant Director of Public Health, Punjab*). (For abstract see p. 143).

**114.** Malaria Survey of part of the Lower Bengal Delta. **Iyengar, M. O. T.** (*Entomologist, Bengal Public Health Department*).

A mosquito and malaria survey of a portion of the Lower Bengal Delta within tidal limits has been completed. The area consists of nearly flat country intersected by several rivers, some of which are actively tidal, while others are in a state of decay. The banks of these rivers are elevated and form high ridges, and in between two rivers are depressions which form natural basins. During the monsoons, these depressed basins are flooded over with storm water. Here we have two distinct types or zones, one which consisting of elevated land in which the level of subsoil water is low, the soil is dry and there is no appreciable accumulation of water, and the other situated on low-lying land, with the subsoil water level close to the ground, the soil is wet for the greater part of the year and there is much accumulation of water everywhere during the monsoons and for several months thereafter. In this area it has been found that, contrary to popular opinion, the dry areas form hyperendemic malaria zones while the so-called water-logged areas with much accumulation of water, have little or no malaria.

The mosquito survey shows interesting seasonal variations in the two types of areas above mentioned.

**115.** Anti-malarial Measures in Poverty-Stricken Regions. **James, S. P.**, Lieut.-Col., I.M.S. (*Ministry of Health, Whitehall, London*). (For abstract see p. 144).

**116.** Experiments on the Treatment of Malaria in England. **James, S. P.**, Lieut.-Col., I.M.S. (*Ministry of Health, Whitehall, London*). **W. D. Nicol** and **P. G. Shute**. (For abstract see p. 147).

**117.** The Habits of Anophelines in Relation to their Rôle in the Spread of Malaria. **James, S. P.**, Lieut.-Col., I.M.S. (*Ministry of Health, Whitehall, London*). **W. D. Nicol** and **P. G. Shute**. (For abstract see p. 151).

**118.** On the Malaria Endemic in the Central Part of Japan. **Katsuno, K.**, Colonel (*Japan*). (For abstract see p. 154).

**119.** Rapport sur les resultats du traitement de divers etats de Paludisme par la Smalarina du Prof. Cremonese. **De Mello, I. Froilano**, Col. (*Director General, Medical Services, in Portuguese India*).

Dans le Congres de Malariologie tenu à Rome on a beaucoup vanté le traitement par la Smalarina du prof. Cremonese, comme la thérapeutique par excellence du paludisme. Son pouvoir curatif et, plus particulièrement, son action immunisante ont été signalés. *Traitement radical et immunisateur du paludisme, sans quinine*, disent les brochures mises à la disposition des médecins.

La Smalarina est un composé de mercure et antimoine, s'administre en tabloïdes, *per os*, 1 le premier jour, 2 le troisième, 3 le cinquième et ainsi de suite jusqu' à atteindre la dose de 16 tabloïdes le 3 lème jour : donc un total de 136 tabloïdes.

Le mécanisme de son action a donné lieu à des surieuses hypothèses qu'on ne discute pas ici. Pour s'en tenir tout d'abord aux faits qui restent qu'aux théories qui sont souvent fallacieuses, l'auteur a voulu vérifier l'action du médicament, avec un rigoureux contrôle clinique, hématologique et parasitaire. L'examen parasitaire a été, toujours, sous la verification directe de l'auteur, l'examen du sang étant fait sous sa direction par ses élèves, la verification clinique soit par l'auteur à l'Hopital, soit par ses délégués de santé dans les parties de la province où la malaria est endémique.

Les malades ont été divisés en séries.

I. Paludisme fébril recidivant avec constatation parasitaire positive.

II. Malaria chronique avec splénomégalie et recidives fébriles irregulières. Constatation parasitaire presque toujours positive.

La première serie a été observée pendant le cours du traitement et quelques jours après. Resultats : effet parasiticide nul ; état clinique et hématologique souvent empiré, reclamant un traitement ultérieur par la quinine et Néosalvarsan. A' remarquer que dans quelques de ces on avait injecté la quinine au cours du traitement pour juguler un accès de fièvre intercurrente.

Dans la seconde série on a surtout voulu voir la prétendue action immunisante et les malades ont été observés pendant 5 à 6 mois, l'expérience ayant été faite durant la saison sèche, non épidémique. Resultats : l'état clinique amélioré en quelques cas, surtout en ce qui conclrne l'asthénie, et l'apparition, quelquefois, des rechutes fébriles ; l'état hématologique sans altération sensible ; action paraciticide nulle ; action reductrice de la splénomégalie en général nulle, quelquefois plus ou moins sensible, mais jamais complète. Donc, la prétendu action immunisante nulle.

**120.** A Few Impressions on a Malaria Survey of a Group of Tea Gardens in Assam. **Ramsay, G. C.**, O.B.E., M.D. (Edin.), D.T.M. & H. (*Assam*).

On July 1st, 1926, after a preliminary study of the various local species of anopheline mosquitoes and their larvæ I began a Malaria Survey of the Labac Medical Practice.

### *Topography & Climatology of the District.*

The Labac Medical Practice is composed of eighteen tea gardens extending about twenty miles in length by about ten miles in breadth and is situated in the Cachar District of Assam.

The District of Cachar is a low-lying plain broken up by isolated hillocks and natural depressions and surrounded by ranges of hills varying from 2,000 to 6,000 feet in height. The plains are highly fertile and are interspersed with rice fields, tea gardens, clumps of jungle, swamps, rivers and streams. The area surveyed although over two hundred miles from the sea is only about 70 feet above sea level.

The climate is characterised by excessive humidity and is markedly oppressive during the Monsoon Season. The hottest months are May to October with an average mean temperature of about eighty-three degrees, the coldest months being January with a mean of about sixty-five degrees. The average rainfall is about 130 inches—the rainfall being practically confined to the Monsoon Season during which period floods are liable to occur. The plains form an alluvial tract—the constituents of the soil being clay, sand and vegetable matter.

### *Details of the Survey.*

The survey began on July 1st, 1926, and terminated on June 30th, 1927, each tea garden being thoroughly examined on seven different occasions at intervals of about six weeks throughout the year.

The survey of the breeding areas extended to about 1,000 yards from each group of coolie lines and about a week was spent investigating each garden during each survey. The maximum number of areas examined during one complete survey of the Practice was 1,561.

Excellent maps were provided by the Managers in charge of the various gardens, all breeding areas were carefully numbered and a complete detailed record made of the findings in the numbered areas.

In addition adult mosquitoes were caught in human habitations and cowsheds throughout the Practice to study the feeding habits of the various species.

Further a careful examination of all children between two and ten years of age who had been born and brought up on the respective gardens was made and the Malaria Spleen Rate recorded. The Spleen Rates in this District are not in my opinion vitiated by the possible complication of Kala-azar as the Labac Medical Practice appears free from the latter disease apart from a very occasional imported case from the Sylhet District of the Surma Valley.

### *Findings.*

From the statistics submitted it will be seen that 166,738 anopheline mosquitoes and their larvæ comprising eighteen species were examined and classified during the year.

Of the total number classified 143,124 specimens were diagnosed in the larval stage, 7,099 adults hatched out from larvæ and pupæ and 16,515 adult specimens were caught in Nature.

The eighteen species found during the survey with the percentage of each species were: *A. hyrcanus* 42.65 per cent., *A. fuliginosus* and *A. philippinensis* 24.12 per cent., *A. aconitus* 8.08 per cent., *A. vagus* 8.06 per cent., *A. karwari* 6.20 per cent., *A. kochi* 4.03 per cent., *A. barbirostris* 3.29 per cent., *A. minimus* 2.14 per cent., *A. aitkenii* 0.73 per cent., *A. ramsayi* 0.25 per cent., *A. jeyporiensis* 0.17 per cent., *A. maculatus* 0.09 per cent., *A. culicifacies* 0.07 per cent., *A. leucosphyrus* 0.03 per cent., *A. gigas* 0.01 per cent., *A. jamesii* 0.002 per cent., and *A. tessellatus* 0.002 per cent.

It will be seen that the two species *A. philippinensis* and *A. fuliginosus* have been grouped together under one percentage. The reason is that the diagnostic differences between these two species at any rate, their larvæ and the larvæ of *A. jamesii* have only recently been clearly defined by the researches of Dr. Puri of the Central Malaria Bureau, Kasauli.

Likewise the erstwhile confusion which prevailed regarding *A. jamesii* was cleared up by Major Covell, Officer in charge of the Central Malaria Bureau, Kasauli, who honoured me by classifying a new species *A. ramsayi* which although an entirely distinct species from *A. jamesii* had formerly been classified as the latter species. When our problems were elucidated we found that over 90 per cent. of our *fuliginosus* group should be classified as *A. philippinensis* and that *A. jamesii* is very rare in this District.

The distribution of the eighteen species throughout the Practice shows that *A. hyrcanus*, *A. philippinensis*, *A. fuliginosus*, *A. aconitus*, *A. kochi*, *A. barbirostris* and *A. minimus* were found on all the eighteen gardens, *A. karwari* on 17 gardens, *A. jeyporiensis* on 15 gardens, *A. aitkenii* on 11 gardens, *A. maculatus* on 8 gardens, *A. leucosphyrus* on 7 gardens, *A. gigas* on 6 gardens, *A. tessellatus* on 4 gardens, *A. ramsayi* and *A. jamesii* on three gardens and *A. culicifacies* on 2 gardens. With the exception of *A. culicifacies* and *A. gigas* adults of all the other species were caught in Nature, 13,565 were caught in cowsheds, 1,657 in coolie houses, 680 in Garden Hospitals, 460 in Babus' Bashas and 153 in Bungalows.

Specimens of all the 16 species were caught in human habitations and all were caught in cowsheds except *A. jamesii* and *A. tessellatus*. Only seven adult specimens of the latter two species combined were captured during the year. The feeding habits as indicated by the relative percentage of each species (except the negligible number of specimens of *A. jamesii* and *A. tessellatus*) caught in human habitations and cowsheds show a preference for human blood only in the case of *A. minimus*, *A. ramsayi*, *A. maculatus* and *A. jeyporiensis* but perhaps the numbers collected of the last three species is rather limited to form a definite conclusion.

The Spleen Rates in 3,465 garden born children from 2 to 10 years of age on the respective gardens vary from 6.36 per cent. to 76.81 per cent., the average for the Practice being 32.49 per cent. An



analysis of the causes of death for five years 1922-26 shows that malaria was responsible for 16.42 per cent. of the total death rate, malaria convulsions being one of the chief causes of mortality amongst coolie children.

### *Breeding Areas of Cachar Anopheles.*

*A. minimus*—breeds in clear grassy streams and drains especially where there is a certain amount of shade, also in seepage from springs. During the cold weather it is abundantly found in grassy tanks and swamps and in seepage water especially where wild saffron grows luxuriantly. On one occasion it was found breeding in a small tank during the Monsoon Season.

*A. maculatus*—breeds in clear running water in streams, springs and drains exposed to full sunlight. The edges were grassy in most of the streams in which *maculatus* was found breeding. It was also found in the seepage of springs.

*A. ramsayi*—breeds in grassy tanks, in permanent pools and swamps with clear standing water in which grass grows luxuriantly.

### *A Few Impressions.*

The importance of larval diagnosis in malaria survey work is evident when it is considered that 85 per cent. of our total specimens examined and classified were diagnosed in the larval stage. If a survey depended entirely on the diagnosis of adults bred out from larvæ much important information would be lost owing to the high mortality amongst larvæ in collecting bottles. Further much valuable time and energy on the part of larva collectors would be wasted apart from the additional expense involved in providing an enormous number of hatching bottles, increased laboratory accommodation and increased laboratory staff.

With regard to the breeding habits of anopheline mosquitoes certain species undoubtedly adhere to certain types of breeding areas. In a District however with a rainfall of over 100 inches which is practically confined to the Monsoon Season new temporary streams and new collections of water of varying types make their appearance, their characteristics varying with the climatic conditions. The various species will then select breeding areas which they find most appropriate for the maintenance of their larvæ. Again when the cold and dry season comes round and the majority of the streams and drains become dried up, stream breeders such as *A. minimus* will be abundantly found in permanent pools, abandoned tanks and in the seepage of swamps.

### *Conclusions.*

*A. minimus* which represents only 2.14 per cent. of our total anopheline findings is the chief carrier of malaria in Assam.

*A. ramsayi* representing only 0.25 per cent. of our total findings was found breeding on three gardens and is a proved natural but mild carrier. It appears to me mainly responsible for the malarial incidence in the garden with a spleen rate of 17.2 per cent.

**121.** Immunity to Malaria. Dr. **Sarkar, S. L.** (*Civil Surgeon, Noakhali*).

In the Chittagong Hill Tracts splenic enlargement was found to be very common amongst the children of the Hill Tribes, but practically absent amongst the adult population. A curve of percentage of spleen enlargement at different ages based on examination of 2,178 children from 1 to 12 years of age showed a gradual fall to the age of 12, the fall being somewhat more abrupt from 7 to 12 than from 3 to 6. This can only be explained on the development of immunity to malaria. Examined results found in respect to Col. James's observations on artificial infections in England. Observations on spleen rate contrast with those made in some other areas (Bengal). The Hill Tribes are likely to develop a greater degree of resistance owing to their strenuous life, etc.

**122.** Malaria Mosquito Control in Rural Singapore. Dr. **Scharff, J. W.**, B.A., M.D., D.P.H., D.T.M. & H. (*Port Health Officer, Singapore*).

This paper deals with the organisation of the intensive anti-mosquito campaign in the Rural Area of Singapore. A comparison of the relative costs and results of oiling and drainage is discussed. The results of the campaign 1922-27 are described.

**123.** Progress towards the realization of Biological Control of Mosquito Breeding. **Senior-White, R.**, F.E.S., F.R.S.T.M. & H. (*Malaria Research Officer, Central Malaria Organisation, Kasauli*). (For abstract see p. 158).

**124.** Report on Grave Cases of Malignant Tertian Malaria Treated with Intravenous Injections of Quinine. **Shaha, B.**, M.B., D.T.M. (London). (*Junior Visiting Physician, Carmichael Medical College Hospital, Calcutta*).

The paper embodies observations on some grave cases of the Malignant Tertian type of malaria treated with intravenous injections of Quinine.

Doses recommended in the text-books, in the opinion of the writer, are dangerous, because of the alarming fall of blood pressure.

Fractional doses, instead of a single massive dose, have been found to be free from any inherent danger.

The conclusion has been arrived at that quinine should be given intravenously *under compulsion*, and not for convenience.

**125.** The Treatment of Malarial Fevers. **Sinton, J. A.**, Major, V.C., I.M.S. (*Director, Central Malaria Organisation, Kasauli*).

The points essential in an ideal treatment of malaria and the modifications necessary for obtaining successful results amongst an uneducated population in the tropics.

The same drugs are not equally effective in benign tertian and malignant tertian malaria.

The methods necessary to test the value of any drug in producing (a) a clinical cure of the disease, and (b) a permanent cure (i.e., the absence of relapse at a later date).

#### *Treatment of Malignant Tertian Malaria.*

Tests of value of (1) quinine, (2) quinine in combination with alkalies, (3) cinchona febrifuge, and (4) cinchona febrifuge in combination with alkali.

Effects of these treatments in producing a clinical cure, a permanent cure and in destroying crescents.

#### *Treatment of Benign Tertian Malaria.*

Differences in case of cure of fresh and chronic infections.

Tests of the value of (A) Cinchona alkaloids—(a) quinine. (b) quinine in combination with alkalies, (c) quinidine, (d) quinidine in combination with alkalies, (e) cinchonidine, (f) cinchonine, (g) cinchona febrifuge, and (B) other drugs—(a) peracrina, (b) stovarsol, (c) stovarsol with quinine, (d) Smalarina Cremonese, (e) Plasmochin, (f) Plasmochin Compound, (g) Quinine Troposan.

**126.** The Effects of Treatment on the Incidence and Degree of Splenic Enlargement in an Adult Population Suffering from Malarial Fever. **Sinton, J. A.**, V.C., O.B.E., Major, I.M.S. (*Director, Central Malaria Organisation, Kasauli*).

The splenic index of an adult population, which has recently been or is being treated with anti-malarial drugs, gives no true indication of the numbers infected with malarial parasites. This is shown by the results of splenic examination in a population the majority of whom were infected with malaria, as diagnosed by subsequent parasitic relapses.

The immediate effects of different drugs in reducing the size of the enlarged spleen varies considerably. The degree of reduction produced seems to give no indication as to whether the clinical cure produced is permanent or not.

Under the conditions of experiment the results obtained would indicate that the splenic index is not a reliable indication of the degree of malarial infection in a population which receives systematic anti-malarial treatment.

**127.** The Success of a Scheme based on our Systematic and Bionomic Knowledge of Anophelines. **Strickland, C.**, M.A., B.C. (*Professor of Medical Entomology, School of Tropical Medicine, Calcutta*).

Classification of anti-malarial measures—evolution of present-day schemes based on the biology of Anphelines. How the experiment now reported upon came about—its operation—and result.

**128.** Efficiency in Malaria Treatment: the Merits of Silversalvarsan. **Dr. Surbek, K. E.** (*Centraal-Hospitaal, Pager-Alam*).

(a) *Introduction.*—Recent Congress discussions (cf. Fruit-Co. U.S.A. 1924, Rome 1925) have once more shown how far international

medical opinion still is from agreement in questions of first importance concerning the treatment of malaria.

If the high value of combined quinine-arsenic treatment seems to be well established and generally admitted, there subsists still much diversity of opinion as to the proper doses and best way of administration of those drugs. Strange to say, there has never been established yet in plain figures the fundamental relation connecting the body-weight of the patient and the dosis efficiens of quinine.

(b) *Necessity of founding the dosis quinine pro die on the body-weight of the patient.*

Undependant of the gravity of the malarial infection one average dose of say 15 grains (1 gram) in 24 hours whilst checking the fever by patients with a body-weight below 60 kilograms—might prove quite unefficient with people weighing more than 70 kilograms. (Refer to clinical personal observations.) We would suggest scale figuring connection between body-weight and daily quinine-dose as follows:

<i>body-weight:</i>	<i>quinine-dose (in 24 hrs. required (quinine hydrochloride))</i>
below 50—50 kilogr. . .	15 grains (1 gram) sufficient
50—70 kilogr. . .	20—25 gr. (1½—2 gram) =
above 75 kilogram . .	30—45 gr. (2—3 gram) =

The above figures as base for attack-treatment duly stated, we shall not detail the different forms of quinine-treatment as required in the various clinical and ætiological types of malaria. As to the value of early associating arsenics with quinine we draw attention to the following points:

(c) *Combined quinine-arsenic treatment.*—If systematically applied in early attacks (alternant use of quinine during 4—6 days and arsenic 2—3 days) able to reduce relapses (figures stated). Arsenic hypodermically as sodium cacodylate, or intravenous as salvarsan.

(d) *Silversalvarsan intravenous: strong direct gametocide action.* Silversalvarsan and Neo-Silversalvarsan given in full dose (i.e., 0.25, 0.3 and 0.4 gram respectively) intravenously by crescent-carriers reduces number of crescents in peripheral circulation enormously within 4—6 hours. Complete destruction of all gametocytes obtainable in favourable cases. (Figures.) Resistant carrier-cases liable to radical cure, i.e., combined simultaneous intravenous injection of quinine and Silversalvarsan. (Special technic detailed.) Epidemiological importance of gametocytes—destruction.

(e) *Advantages of Silver (and Neo-Silver) Salvarsan.*—Higher stability in the Tropics than Neosalvarsan, meaning reduced danger of toxic accidents. Liability to be introduced in weak Iodine (Lugol) solution (formula stated), which, in reducing percentage of angioneurotic shock, improves markedly the therapeutic effect.

(f) *Remarks on the value of Fe, Hg, and Iodium as adjuvants in malaria-treatment.*

(g) The *adrenaline-test* (contraction of enlarged spleen), its technic and value in diagnosis (provocation-proof) and prognosis (indication of splenectomy).

(h) *Conclusion.*

**129.** The Future of Malaria Control in the Malay Peninsula. **Watson, Sir Malcolm**, Kt., M.D., L.L.D. (*Klang, Federated Malay States*). (For abstract see : p. 162).

**130.** Organic and other Chemical Factors which Influence the Breeding of Anopheline Mosquitoes in special reference to Vibrification. **Dr. Williamson, K. B.** (*College of Medicine, Singapore*). (For abstract see p. 164).

### KALA-AZAR.

**131.** The Action of the Pentavalent Compounds of Antimony on the *Leishmania donovani* Parasite. **Chopra, R. N.**, Major, M.A., M.D. (Cantab.), I.M.S. (*Professor of Pharmacology*) and **Acton, H. W.**, Lieut.-Col., I.M.S. (*Professor of Bacteriology and Pathology*) (*School of Tropical Medicine and Hygiene, Calcutta*).

During our researches on the action of specific drugs, one of us (R. N. C.) noticed the marked effect that the pentavalent compounds of antimony, especially Urea Stibamine and amino stiburea had in causing marked alterations in the volume of the spleen. We considered that this action may in some way account for the better therapeutic results obtained clinically by these two compounds. We decided to investigate how these compounds acted on the parasite and bring about a cure of the disease. We found that the *Paramoecium caudatum* could live for hours in a solution of 1—100. Urea Stibamine, whilst flagellate cultures of the *Leishmania donovani* could survive for 10 minutes in a 1—25 concentration without being killed, so that their action would appear not to be a direct action. Napier had noticed that a good number of his cases of kala-azar, even after a course of these newer pentavalent compounds were still positive on spleen puncture or culture, and often without any further treatment went on to a permanent cure. The drug therefore stimulated some tissue in the body, and thus brought about a cure, although further treatment was not given to the patient. The so-called immunity that is seen after a course of Bayer's No. 205 against trypanosomiasis appears to be somewhat similar in nature to the effect produced by these compounds of antimony. In the case of Bayer's No. 205 it is considered that the drug stimulates the reticular-endothelial tissue. We will review our clinical and experimental data before we attempt to discuss the action of these compounds. We know that the parasites multiply chiefly in the spleen, liver and bone-marrow and to a lesser extent at other sites, and invade the endothelial cells of the reticular-endothelial tissue in these areas. When they come into the blood stream they may be engulfed by the leucocytes and destroyed by these cells. Muir, Rogers and others have shown that any drug or condition that causes leucocytosis, for example injections of turpentine, cancrum oris, etc.,

helps to bring about a cure. In kala-azar, the bone-marrow function is depressed as is evidenced by the marked leucopenia present, viz., 2—3000 leucocytes per cm.m.

We found that these antimony compounds had the following action on the different tissues of the body.

(A) There was a great increase in the volume of the spleen, with very marked rhythmic contractions.

(B) It stimulated the bone-marrow, as the leucocyte count was increased from 2—3000 per cm.m. to 7—9000 per cm.m. after a course of treatment.

(C) Stimulated the function of the adrenal medullary tissue because, (i) we have found the drug useful in chloasma (due to hypoadrenia) whether the cause was due to kala-azar or not. (ii) The adrenal content was higher than in normal animals after a course of treatment. (iii) Occlusion of the adrenal vein prevents the contractions of the spleen, and (iv) the results of the adrenalin test in patients before and after treatment. Unfortunately we have as yet not been able to work out the distribution of antimony in the different tissues, nor the rate of its elimination from the body: two important factors that may throw some light on the so-called resistant cases of kala-azar, which may be due to these factors, or to the failure of the tissues to respond to the stimulation by antimony.

We therefore consider that the *Leishmania* parasite of kala-azar is destroyed in the following ways, by

(A) Leucocytosis and phagocytosis. Owing to the rhythmic contractions of the spleen many of the heavily infested endothelial cells burst and set free the parasites. This can be demonstrated clinically—in the use of antimony as a provocative test. The parasites are engulfed by the polymorphonuclear leucocytes and destroyed—such is the fate of some of the parasites.

(B) Diminished cell permeability. The hyperadrenia that is produced causes a marked dilatation of the vessels of the liver and spleen pulp, which means that the rate of diffusion from the tissues is greater than the rate from the vessels—as is shown by an increase in the blood sugar, etc.; this can be shown clinically. Diminished permeability of the cells means that less food is available for the parasites, consequently the rate of reproduction is markedly diminished, and the parasites are slowly starved to death. This is probably the most important factor that brings about cures.

**132. Observations on the Diagnostic Value of Antimony Test for Kala-azar.** Chopra, R. N., Gupta, J. C. and Basu, N. K. (*From the Department of Pharmacology, Calcutta School of Tropical Medicine and Hygiene*).

In papers published previously we have shown that when solutions of some organic compounds of antimony are brought in contact with the serum from kala-azar patients a thick flocculent precipitate is produced. This precipitate is not formed with serum from non-kala-azar patients and is a specific reaction which can be used as a diagnostic test for kala-azar. In this paper we give an

analysis of 400 sera from kala-azar and non-kala-azar patients, and show that the percentage of positive reactions with this test is higher than those with the aldehyde reaction performed on the same sera. We also show that this test has certain advantages over the aldehyde test, namely (1) that the results can be read at once and (2) that positive results are obtained with early cases of the disease when aldehyde test is still doubtful or negative. A simpler and just as sensitive test for kala-azar has been worked by us in which the blood from a finger prick can be used for diagnostic purposes. This paper gives an analysis of 250 cases examined with this test and it has been shown that the finger prick test is much simpler, is just as sensitive as the serum test and is capable of application in the field on a very large scale. The antimony tests are sometimes positive in advanced cases of leprosy, tuberculosis and chronic malaria with enlarged spleen of long standing duration. The differential diagnosis of these conditions with the test is discussed.

**133.** A Note upon Experimental Transmission of Oriental Sore (causing Generalised Infection) to Laboratory Animals. **Das Gupta, B. M.**, Assistant Surgeon. (*Assistant Professor of Protozoology, School of Tropical Medicine and Hygiene, Calcutta*).

A young guinea-pig and 2 English mice were inoculated intraperitoneally, subcutaneously and intradermally respectively with 2 weeks old *Leishmania* tropical culture. All these three animals were found to have developed visceral infection when killed and examined 93 days later. In the case of the guinea-pig a distinct papule appeared at the site of inoculation 21 days after and this persisted, but did not ulcerate, till the animal was killed. Scrapings from the nodule examined from time to time showed scanty streptothrix but no *Leishmania*. The second mouse showed a diffuse induration around the site of injection soon after but disappeared within a week.

**134.** The Kala-azar Transmission Problem and the Factor of Resistance. **Knowles, R.**, Lieut.-Col., I.M.S. (*Professor of Protozoology, School of Tropical Medicine and Hygiene, Calcutta*).

Wenyon (1911) discovered 6 per cent. of wild sandflies in Aleppo infected with "natural" herpetomonad, but misled into work on *Aedes*. Mackie (1914) discovered herpetomonad (? Bodo) in *P. minutus* in Assam, and drew attention to sandflies. Sergeant brothers, Lemaire and Senevet (1915) failed to transmit oriental sore by *P. minutus*. Acton (1919) showed corresponding distribution of oriental sores and of sandfly bites on surface of body. First positive results obtained by Sergeant brothers, Parrot, Donatien and Beguet (1921) on inoculation of emulsion of wild sandflies into arm of volunteer. Chequeira (1920) showed cases of espundia following at sites of sandfly bites. Arãgao (1922) found herpetomonads in wild *P. intermedius*; on inoculation into dog, lesion following showing leishmania parasites.

Organisation of the enquiry at the Calcutta School of Tropical Medicine in 1922. Napier's (1923) analysis of season of onset of kala-azar indicated period July—October as season when fresh infections

most likely to take place. McCombie Young (1923) reported similar findings. Napier's (1923) analysis of places of residence in Calcutta city of (a) imported cases, and (b) indigenous cases. Discovery of endemic focus of kala-azar in Ward 14 and Entally; on other hand in N. Calcutta, although infection frequently imported, does not spread. Napier's (1925, 1926) studies of the epidemiological environment under which kala-azar spreads. The 21 cardinal points.

The only blood-sucking insects that fit the 21 cardinal points are Culicoides and sandflies. Elimination of the former (also of bed bug, Triatoma, etc.) by the Kala-azar Commission. Smith's sandfly studies in Calcutta city. Of three species present, *P. squamipleuris* very scanty; *P. minutus* apparently a pure lizard feeder, and does not bite man; leaving *P. argentipes* as the most likely suspect. *P. argentipes* swarming in endemic centre during monsoon period. Accordingly direct feeding experiments with *P. argentipes* instituted from July—October 1924. Results; immediate and striking success (Knowles, Napier and Smith, December 1924). Confirmation by Kala-azar Commission (January and subsequently, 1925).

Rapid progress from January 1925 to March 1926, chiefly as result of splendid work of the Kala-azar Commission. Cycle in fly worked out in detail, and embodied in important memoir of Shortt, Barraud and Craighead (1926). Infectivity of flagellate forms in fly proved. Wild fly discovered infected in Nature. Massive infection demonstrated in buccal cavity at 7th to 8th day. Studies of longevity of *P. argentipes* under certain climatic conditions; technique of re-feeds. Contrast between modes of transmission of leishmania infections and of natural herpetomonad infections of insects. Parallel work of Adler and Theodor (1925—1927) on *P. papatasi* as vector of oriental sore in Palestine. Parallel work by workers in China, leading to incrimination (May 1927) by Patton and Hindle of *P. major* var. *chinensis*, as vector of Chinese kala-azar. Re-definition of genus *Leishmania* by Wenyon (July 1926).

Position in March 1926 apparently very favourable. Only one final proof now wanted, viz., to actually transmit kala-azar from man to human volunteer or experimental animal by bite of infected sandflies. Yet, despite enormous amount of work, both by Kala-azar Commission in Assam, and at Calcutta School of Tropical Medicine, period March 1927 to August 1927 has seen nothing but failure to afford this final proof.

### Why ?

The writer believes that the reason is that man—and still more so, the experimental animal, instead of being very susceptible to infection with kala-azar is extremely resistant to it. Even the Chinese hamster has proved relatively resistant in India, where it does not hibernate.

The evidence in favour of this view.

(a) *Epidemiological*.—The curiously slow mode of spread of even epidemic kala-azar. The association of epidemic kala-azar with lowered vitality or debilitated state of people; eg., big Nowgong



epidemic followed after Assam earthquake; recent recrudescence in Assam followed close after the influenza pandemic.

(b) *Clinical*.—The modes of onset of kala-azar. Frequent commencement of the disease as a true infection with *B. typhosus*, or as a true malaria with malaria parasites in blood films; followed by febrile relapse with *L. donovani* culturable from peripheral blood. The contrast between malaria as a disease of sthenic individuals and kala-azar as a disease of debilitated individuals. The hyperadrenia of kala-azar.

Dermal leishmanoid. The contrast between it and kala-azar, though both due to *L. donovani*. Its association with hyperadrenia. The pigmentation of the skin in kala-azar as an indication of adrenal insufficiency.

(c) *Experimental*.—The very great difficulty and uncertainty of inducing true kala-azar in experimental animals, even after injection of massive doses of virus. The frequency of transient and symptomless infections in animals. The much greater frequency of failure of infection to take at all.

Hypothesis suggested, that in endemic areas mankind may get infected wholesale with *L. donovani*. In vast majority of persons parasite may never cause any symptoms at all; several remarkable cases in literature of very prolonged incubation and latent periods of kala-azar. In some persons with high resistance (probably associated with hyperadrenia) the infection only produces dermal leishmanoid. In a relatively few persons, whose resistance is unduly lowered by high food prices or intercurrent disease, the parasite causes true kala-azar.

Hence belief that to continue feeding hundreds of infected sandflies on healthy human volunteers or experimental animals may lead us nowhere. We want a study of the nature of, and the factors underlying, this resistance, and to find out how to break it down. Recent attempts in Calcutta along these lines; sub-total thyroidectomy and adrenalectomy in experimental monkeys.

Before the last and final proof that kala-azar is transmitted by sandflies is afforded, this factor of resistance will probably have to be studied and overcome. This involves team work in a large institution, and the services of a biochemist.

**135.** De la Propagation en U.S.S.R. du Kala-azar et du Bouton d'Orient. **Marzinowsky, E.**, Professor (*Director, Tropical Institute, Moscow*).

**136.** The Life-History of *Leishmania donovani* in its insect and mammalian hosts. **Shortt, H. E.**, Major, I.M.S. (*Director, Kala-azar Commission*).

The life-history of *Leishmania donovani* can be represented diagrammatically by a figure 8, one circle corresponding to the cycle in the insect, the other to that in the mammal, while the central point of construction the only point where the two cycles meet represents the bite of the fly, either at the time of ingesting the parasite from the mammalian blood or of returning it to a fresh mammalian host. The

two cycles will be described separately, and the act of biting of the fly, the only point where they meet, will then be considered.

*Life-cycle in Phlebotomus argentipcs.*

The sandfly at its initial feed ingests Leishman-Donovan bodies (type I) from the peripheral blood of a case of kala-azar.

After twenty-four hours the original compact Leishman-Donovan body has increased considerably in size. The flagellar vacuole is a prominent structure, the cytoplasm stains a deep blue with Romanowsky stains, and usually contains vacuoles. The flagellum is unformed or rudimentary (type II). Aflagellate division forms may be present. All the forms are immobile.

After forty-eight hours the swollen aflagellate forms have become somewhat elongated and have developed flagella, the latter being often in a rudimentary stage. The flagellates are sluggishly motile but incapable of active translatory movement. The types of flagellate present are type III, stumpy or rounded flagellates, and type IV, immature or larval forms. Division forms are numerous.

Three days after the fly's feed one finds the first appearance of elongated free-swimming flagellates. These are chiefly of type Vb. Types III and IV, already present on the second day, are greatly increased in numbers, and division forms are much in evidence. A few "rosettes" of flagellates may be present. The free-swimming flagellates show an intense activity which would enable them to penetrate to any situation in the gut. The flagellates appear to be distributed indifferently throughout the midgut. The end of the third day marks a definite stage in the life-history since now most of the forms of flagellate present in the later stages have already made their appearance.

From the fourth day onwards there is seen intensely active multiplication resulting in an enormous increase of all the types of flagellate already mentioned. A new factor of importance is also now in evidence. This is a progressive concentration of the flagellates in an anterior direction. From this stage onwards the advance of the infection is directed continuously forwards towards the biting parts.

By the fourth or fifth day the fly will usually have taken its second feed. At this stage it will be convenient to describe the appearance of a heavily infected fly on about the fifth day after its initial feed. If the entire alimentary canal be dissected out the conditions now to be described will be found.

The anterior end of the midgut especially near the proventricular region will be found to be swollen out by a solid refringent mass of flagellates. The centre of this mass will appear practically immobile but its periphery posteriorly will exhibit a seething motility. The reason for this is that so closely are the flagellates packed that only those on the outskirts of the mass have any opportunity to move. A varying number of actively free-swimming elongated flagellates will be in evidence posterior to the main mass. The flagellates near the proventricular region and those near the periphery of the mass more posteriorly will be seen to be attached by their flagellar ends to the

walls of the gut. These sessile forms are chiefly of types III and IV and, owing to their cramped situation, are not the source of the seething motility mentioned. This is produced entirely by the forms which are near the periphery of the main mass and so can project into the lumen of the gut. These forms appear to be mainly of type V.

The anterior extremity of the infection at this stage reaches the œsophagus of the fly but may in some cases extend as far as the posterior expanded portion of the pharynx. In the midgut immediately posterior to the anteriorly placed mass, there are numerous free-swimming elongated flagellates but these decrease in concentration posteriorly and the posterior half of the midgut and the whole of the hindgut are practically free of flagellates.

From the condition just described, which is that reached by the fifth day after the initial feed, there is a progressive extension anteriorly of the main flagellate mass until by the eighth or ninth day after the initial feed it has reached the mouth proper of the fly; and the most anteriorly placed flagellates are projecting into the prestomum. The main mass of the flagellates as it progresses anteriorly by growing along the pharyngeal and buccal cavities practically occludes the lumen of the alimentary canal especially in its narrower portions. The progressing anterior extremity of the main mass has usually located in front of it a few elongated free or semi-detached flagellates, since a free surface always seems to encourage the production of the more elongate forms. The extent and rapidity of the development here described depend to a great extent on the initial number of parasites ingested, the larger the number the sooner the infection of the alimentary canal is complete. An average time table, however, for the anterior portion of the main growth would be as follows:—

Proventricular region fifth day.

Posterior part of pharynx sixth day.

Junction of pharynx and buccal cavity seventh day.

Invasion of buccal cavity eighth day.

Anterior end of buccal cavity ninth or tenth day.

Besides the alimentary canal proper the flagellate infection may invade the malpighian tubules, where flagellates in small numbers may be seen, and the œsophageal diverticulum which may be, and in heavy infections usually is, the seat of a massive growth of flagellates.

### *Life-cycle in the Mammalian Host.*

If a fly which is infected to the extent described in the last section were to feed it would appear necessary that some at least of the flagellates blocking the alimentary canal should be extruded before the blood cells could pass up the proboscis. Presuming, then, that this takes place, the sequence of events following the bite of the fly may be described as follows:

The flagellates ejected into the wound are engulfed, probably singly, by endothelial cells derived from the blood capillaries or lymph channels, thus gaining an intracellular habitat.

In the process the flagellate loses its flagellum and its body rounds up into the typical Leishman-Donovan form.

The endothelial cell gains the blood stream and may be carried to any part of the body but the sites of ejection for its lodgement are, in the order given, spleen, liver and bone-marrow.

The intracellular Leishman-Donovan body now commences to divide by binary fission into two individuals.

Multiplication proceeds with the production of four, eight, sixteen individuals up to the capacity of the invaded cell to contain its load of parasites.

A point is finally reached where the endothelial cell can expand no further and is ruptured releasing the contained Leishman-Donovan bodies.

These are taken up afresh by new endothelial cells of the tissue in which they are lying, and the process is repeated until finally an intense infection of the endothelial tissue of the whole organ may result, accompanied by an increase in size of the organ.

Some of the Leishman-donovan bodies liberated from the tissue endothelial cells of the organ involved may be taken up by endothelial cells or mononuclear cells of the blood capillaries, thus giving rise to the presence of parasites in the peripheral blood of the mammal.

From the peripheral blood the parasites are again taken up by a sandfly at its feed and the cycle in the insect is repeated.

*The method by which the flagellates in the Sandfly are transferred to the mammalian host.*

If we take the prestomum of the fly as the limit of anterior progression of the flagellates, we find that latter have still to traverse the whole length of the proboscis in order to gain access to the wound.

It is almost certain that the individual flagellates could not swim along the whole length of the proboscis in a comparatively short time to gain access to the wound. This would imply the presence of a fluid medium to swim in and a rapid and continuous progression of the flagellate in one direction. In other words the parasite does not possess its flagellum in order to swim into the wound.

• As the narrowest parts of the alimentary canal of the fly in its head are completely blocked with flagellates it follows that the blood cells cannot enter until the blocking plug is ejected. This must necessarily take place in an anterior direction where the resistance is least. Therefore the flagellates probably enter the wound in the form of a plug and as the result of an expulsive effort of the fly rather than by any volition on the part of the flagellates.

## PROTOZOOLOGY.

. 137. Preliminary Observations on the Morphology and Life-history of *Spirochata anserina*. Knowles, R., Lieut.-Col., I.M.S. and Das Gupta, B. M., Assistant Surgeon (School of Tropical Medicine and Hygiene, Calcutta).

Gaps in our knowledge of the morphology and life-histories of the spirochætes. *Spirochata anserina*, a spirochæte especially

suitable for laboratory study, and has been subject of much work by previous observers. Balfour's account (1907-13) of cycle in vertebrate host of 'after-phase' of the disease, and supposed granule phase of spirochæte. Cycle in the tick, *Argas persicus*. Hindle's account (1912) of supposed granule phase and of hereditary transmission in the tick. Work of Marchoux and Couvy (1913); they consider granules in Malpighian tubules to be normal structures of the tick and to have no connection with spirochætes; account of penetration of ova by spirochætes in the fluid secretion from the glands of Gene's organ. Present observations commenced with a view to try to ascertain the true and full life-cycles in vertebrate and invertebrate hosts.

*Cycle in the vertebrate host.*—Apparent absence of relapses in all the 126 fowls inoculated and examined. After intravenous injection of 0.5 c.c. of infected blood, incubation period of 24 to 48 hours, and then spirochætes appear in blood, where they survive from 1 to 7 (average 2.5) days. Fowl gets one attack only; then either dies or recovers. Symptomatology of the disease in sick fowls. Formation of 'tangles' of spirochætes in blood; 'tangle formation' apparently always a prelude to death and disintegration of the spirochætes. Findings in the viscera of infected birds. Balfour's 'after-phase' not as a part of the disease, but occurs also in control non-inoculated fowls, if subjected to much handling and kept in small cages. Death of some birds at late periods, e.g., up to 27 days after inoculation, when blood has been negative for many days. Findings in viscera of such birds; karyorrhexis and karyolysis in endothelial cells. Non-infectivity of bird's blood after spirochætes have disappeared. Occasional late finding of spirochætes in brain tissue and possible correlation with C.N.S. symptoms. Balfour's granules as the result of karyorrhexis of nuclei of R. B. Cs., poisoned by the toxins of the disease. No evidence of existence of any intracellular or granule phase of spirochætes in the vertebrate host. Destruction of spirochætes in blood stream appears to be brought about entirely by production of antibodies in plasma.

*Cycle in the invertebrate host, Argas persicus.*—(a) *At room temperature*; 82 to 99° F. Special value of direct dark ground examination throughout the whole work; gives far superior results to examination of stained smears. Examination of 58 such fed ticks. Cycle appears to be as follows. Of the ingested spirochætes about 85 to 90 per cent. disintegrate and go to pieces; they accumulate in larger and larger tangles in the gut and diverticula, become immobile and disintegrate; the masses looking like fleecy, silver clouds under the dark-ground. Others which survive are either (1) normal, actively motile forms, or (2) very long 'jointed' forms consisting of from 3 to 8 dividing individuals. Surviving spirochætes multiply rapidly by repeated transverse (never longitudinal) division. Production finally in gut and diverticula of exceedingly thin, small, and very actively motile spirochætes; 'tenue forms.' Malpighian tubes only rarely infected (in 4 out of 58 fed ticks) and then only with an occasional spirochæte from rectal diverticula.

'Tenue' forms invade coelomic cavity from 5th day onwards. Motile spirochaetes found in almost all viscera of the tick; e.g., coxal gland, testis, white gland, ovary, uterus and brain. Especially numerous and very actively motile in the salivary glands, where rapid multiplication takes place, the spirochaetes tending to become larger and more normal in type. Salivary glands positive from 6th day onwards; and saliva experimentally infective from 7th day onwards (possibly earlier). Transmission appears to occur regularly via the salivary glands, but also occasionally (7 out of 58 ticks) via the coxal secretion. No evidence whatever of any granule phase in the tick, but the very delicate 'tenue' forms easily overlooked unless the dark-ground be used. Remaining spirochaetes in gut now die off gradually, up to the 31st day.

(b) In cool room at 60 to 85°F., cycle in tick appears to be similar, but percentage of negative ticks is smaller than at room temperature. Observations on 33 such ticks. All viscera of tick found infected, and motile spirochaetes in salivary glands from 6th day onwards.

Ovaries found infected in 5 out of 91 ticks examined, and ova probably infected *in situ* in the ovary.

Paper of a preliminary character, and observations still in progress.

**138.** On the Influence of the Thyroid Gland on the course of a Protozoal Infection. **Knowles, R.**, Lieut.-Col., I.M.S. and **Das Gupta, B. M.**, Assistant Surgeon (School of Tropical Medicine and Hygiene, Calcutta).

Our ignorance of the factors underlying resistance and susceptibility to protozoal diseases. Control of the body mechanism largely rests with the endocrine glands. Hence present investigation was undertaken to investigate in the first instance the rôle of the thyroid gland, as the great regulator of body metabolism. Necessity for selection of suitable parasite; *Trypanosoma evansi* chosen, as this would permit of numerical and statistical enquiry.

Great variation of type of the disease in different hosts. The course of surra in the guinea-pig, disease of chronic or relapsing type, ending in death in from 40 to 90 days. Surra in the rabbit also a disease of chronic and relapsing type, ending in death after a period of prolonged wasting, usually from a terminal pneumonia. Monkeys (*Macacus rhesus*) much more susceptible, disease tending to be acute and ending fatally within a few days. In the white rat disease of hyper-acute and fulminant type. Original strain killed in 7 to 8 days after intraperitoneal injection of standard dose; but by repeated subpassage strain evolved which almost invariably killed in 60 hours. Numerical observations, curves, and coefficients of variation of length of *T. evansi* in these different hosts. Mechanism of trypanosome lysis in the vertebrate host.

Sub-total thyroidectomy in the monkey. Injection of standard dose to thyroidectomised monkeys, with equal number of normal controls. Disease in the thyroidectomised animals even more acute than in the controls. Results in inoculated rats previously subjected

to an intensive course of thyroid feeding prior to inoculation more variable. May be but little difference between thyroid fed animals and normal controls; but here and there an individual rat responds in a remarkable manner; the resistance rises, and the disease tends to become of chronic and relapsing type rather than acute. Both after thyroidectomy and thyroid feeding the differences seen appear to be more marked with occasional *individual* animals than with groups; and any correlationship that may exist between the state of thyroid activity and the susceptibility or resistance of the animal is of only a partial character.

This may be explained by the work of Schern (1925) on trypanosomiasis. Our final experiment, in confirmation of his work, appears to show that the trypanosomes live on the blood-sugar, and that death during the acute phase in surra is associated with an absolute hypoglycæmia. Since the blood-sugar content is dependent on the activity of the liver and of the adrenal glands, the control of the thyroid over these activities and over the blood-sugar content must be but a partial one.

• 139. Trichonymphides de l'intestine de *Leucotermes indicola* Wasm., avec reference speciale a la complexite de leurs phenomenes mitotiques (with lantern slides). **De Mello, I. Froilano**, Col. (*Director-General, Medical Services, in Portuguese India*).

L'intestin du *Leucotermes indicola* Wasm., est parasité par une faune abondante et variée. Les Trichonymphides, les seuls protozoaires qui font l'objet de cette communication, appartiennent à trois genres :

*Pseudotrichonympha* Grassi & Fôa 1911 *emend* Grassi 1917.  
*Holomastigotoides* Grassi & Fôa 1911 *emend* Grassi 1917.  
*Spirotrichonympha* Grassi & Fôa 1911.

Du premier genre on trouve une seule espèce; du second, huit espèces dont 5 appartiennent à un type et trois à un type différant de l'autre par la conformation de son pôle antérieur où l'on trouve cependant des organelles homonymes de celles qui caractérisent le premier; du troisième genre, deux espèces.

Description détaillée de la cytologie et des organelles complexes qui les constituent, d'après études *in vivo* et après colorations vitales et post vitales et surtout par fixation humide et coloration par l'hémalum de Mayer et hématoxyline à fer d'Heidenhain. Structure du noyau à l'état de quiescence. Disposition des chromomères en filaments leptotènes, zigotènes et pachytènes et contractions synaptiques rappelant les divers états de la diakinèse des cellules sexuées, états pour lesquels on accepte dans ce cas la désignation de pseudosynapsis de Kofoid et Swezy.

Mitose nucléaire et ses diverses étapes. Rôle du centro-blépharoplaste. Fibrilles spéciales sortant du centro-blépharoplaste et supportant la parademose dans les genres *Pseudotrichonympha* et *Spirotrichonympha*. Formation des asters dans le genre *Holomastigotoides*. C'est possible que les états de pseudosynapsis représentent les premières phases des phénomènes divisionnels précédant le dédoublement du centro-blépharoplaste.

Dimensions et caractérisation des espèces son identification vis-à-vis des espèces décrites par les auteurs chez d'autres termites.

La présente communication actualise, corrige et remplace définitivement les études antérieures de l'auteur sur les Triconymphides du *L. indicola*.

## TYPHUS-LIKE DISEASES, SPIROCHÆTOSES, ETC.

**140.** The Diagnosis of Yellow Fever. **Hoffmann, W. H., M.D.** (*Professor, Laboratorio Finlay, Cuba*).

Last year the writer had the opportunity to prove the endemicity of yellow fever in West Central Africa, from the histological examination of a number of cases. So the yellow fever problem is of great practical importance for the countries round the Indian Ocean.

In this case, after all the negative results of 10 years' work, the histological method of diagnosis was superior to all the others. The lesions in the liver are so extraordinary that they always allow of a diagnosis, which may be supported by the lime-casts in the kidney.

In slight endemic cases the clinical diagnosis may remain impossible. Also the first epidemic cases generally were overlooked, though in a murderous epidemic the cases do not leave much doubt. The clinical diagnosis depends on the albuminuria and the incongruence between pulse and temperature, but always a very careful observation of the course of the disease is necessary, because all the other symptoms are very inconstant and varying.

The bacteriological diagnosis is without practical value on account of its difficulty; only exceptionally it has been possible to find the *Leptospira icteroides*.

The diagnosis from the specific antibodies of the serum does not help in the first days of the disease, but it is useful to form a retrospective opinion on cases that have passed the disease.

Yellow fever diagnosis is not easy, still, if an epidemic is developing, it should always be possible. The Public Health authorities of the Far East may easily come into the situation, that they have to make the diagnosis of yellow fever. Only if the first case is immediately detected, it is possible to avoid disastrous epidemics.

**141.** Typhus-Like Fevers Conveyed by Ticks. **Megaw, J. W. D.,** Lieut.-Col., C.I.E., I.M.S. (*Director, School of Tropical Medicine and Hygiene, Calcutta*).

**142.** An Attempt to Transmit *Leptospira icterohæmorrhagica* by *Aedes argenteus* and *Aedes albopictus*. **Neave Kingsbury, A.,** M.B., B.S., D.P.H., D.T.M. and H. (*From the Institute for Medical Research, Kuala Lumpur, F.M.S.*).

In cases of Weil's disease, the presence of *L. icterohæmorrhagica* in the peripheral blood during the first week of the disease is usually demonstrable by culture or guinea-pig inoculation. Positive results, from the examination of stained blood films taken on the 3rd, 4th, and 5th day of disease, have been obtained in the Federated Malay States. Insect carriage therefore seems a possible mode of transmission



and, from analogy with yellow fever, *A. argenteus* would appear to be a likely carrier.

A mosquito cage 2 ft. by 3 ft. 6 in. by 2 ft. high was constructed in which some 30 *A. argenteus* were bred out. Infected guinea-pigs, with *Leptospira* in the peripheral blood, were introduced for a period of 48 hours. The mosquito fed well on these animals. After removal of the infected animals the floor of the cage was disinfected. A young guinea-pig was introduced immediately afterwards for a period of 12 hours. Other young guinea-pigs were placed in the cage for the same period on every second day for three weeks. The mosquitoes fed well but none of the animals became infected.

Weil's disease has been reported from many areas in Malaya where *A. albopictus* abounds and *A. argenteus* is but rarely seen. Accordingly the experiment was repeated employing *A. albopictus* instead of *A. argenteus*. Although three essays were made, none of the young guinea-pigs showed signs of infection. Three weeks after the original feeding, surviving mosquitoes were dissected and examined for *Leptospira* with negative results.

The results of these experiments are not regarded as furnishing conclusive evidence that *Aedes* cannot act as a vector. In view of the susceptibility of the guinea-pig to infection, however, it appears improbable that these species function as efficient carriers.

**143.** A Pseudotyphus Epidemic in Southern Queensland and its bearing upon the ætiology of Pseudotyphus in India. **Strickland, C.,** (Prof., School of Tropical Medicine and Hygiene, Calcutta).

The epidemic was observed in 1925, while the author was on leave. It was popularly thought to be connected with a mouse plague, this point of view, as well as other possibilities, being analysed from the entomological side. The conclusions from that epidemic are applied to analysis of the corresponding Indian cases.

## MEDICAL ENTOMOLOGY.

**144.** The Morphology of the Buccal Cavity of the Mosquito. **Barraud, P. J.,** F.E.S., F.Z.S., F.L.S. and **Covell, G.,** Major, M.D., I.M.S. (From the Central Research Institute, Kasauli).

The study of the morphology of the buccal cavity in Anopheline and Culicine mosquitoes has shown that as regards the female there are marked differences in various groups.

With regard to the Anophelines the species may be arranged in five classes. The members of four of these classes possess a bucco-pharyngeal armature, this feature being absent in the remaining one. The differences in the structure of the buccal cavity in the five classes are so marked that it has been found possible at a glance to place any of the species examined in the class to which it belongs. In certain cases it has been shown that species which have previously thought to be very closely allied differ remarkably as regards the morphology of the buccal cavity.

With regard to the Culicines, of the genera examined only *Lutzia* and *Culex*, including the subgenera *Culicomyia* and *Lophoceratomyia*

possess a bucco-pharyngeal armature. The structure of this differs very markedly in different groups. As in the case of the Anophelines it has been shown that certain species which in other respects appear to be allied differ strikingly as regards the morphology of the buccal cavity.

It is concluded that although the study of the morphology of the buccal cavity of mosquitoes is generally of little help in the differentiation of closely allied species, yet it is of great value in indicating the group to which a given species belongs, and may prove of great importance in cases where only the female of a species is available for examination.

**145. Regional Distribution of Anophelines and Malaria in Bengal. Iyengar, M. O. T. (*Entomologist, Bengal Public Health Department*).**

The Province of Bengal extends from the Himalayas on the north to the sea, and includes various types of country, in each of which the prevailing conditions regarding anophelines and malaria are diverse. In Bengal we could distinguish the following zones, the montane, the submontane, the pastoral, the upper deltaic, the lower deltaic and the mangrove. Each of these seems to have a characteristic anopheline fauna of its own. Twenty-six species of anopheles have been collected in Bengal and their distribution is discussed. The changes brought about in the anopheline fauna and the prevalence of malaria through human and natural agencies in the different regions are discussed.

**146. Protozoal Parasites of Anopheles in Bengal. Iyengar, M. O. T. (*Entomologist, Bengal Public Health Department*).**

Two common protozoan parasites account for a considerable mortality among anophelines in Bengal. The first is *Thelohania*, a genus of Microsporidia, and the other is a gregarine. The former has so far been found to attack six species of *Anopheles* larvae in Bengal and as the forms found in the different species show clear variations, it is likely that more than one species is concerned in this infection. The gregarine infests more than six species of *Anopheles* larvae, and here too it appears that there are possibly several species of them.

Larvae infested with these parasites are easily recognised. *Thelohania* infected larvae present a whitish opaque and slightly swollen appearance. The parasites form whitish masses under the skin, most commonly in the thoracic region. The cells of the gregarine are easily seen within the body cavity of the larvae. The diseased larvae do not undergo any further development except in size, and sections show that the wings, legs and other imaginal parts of the future insect are either totally wanting in the infected larvae or are present as very small rudiments. The entire body is filled with living cells and spores of these parasites and with the exception of a few essential parts like the heart, the tracheæ and the alimentary system, all other tissues are destroyed. The contrast between a section of the healthy larvae and that of a diseased larvae is very striking.

The larvæ do not pupate at all, and they finally die. In the case of extremely feeble infections, however, the pupation and the emergence of the adult is possible and in those cases, the parasites could be found in the adult mosquito. But ordinarily, the diseased larvæ die without undergoing any further development and thus the spores are liberated in the water and fresh infection occurs by healthy larvæ swallowing these spores.

**147. Parasitic Nematodes of Anopheles. Iyengar, M. O. T.** (*Entomologist, Department of Public Health, Bengal*).

Two forms of parasitic nematodes have been found to infest *Anopheles* in Bengal, one which is present in the larva and the other which parasitises the adult mosquito.

*Mermis* is the genus which infests the larvæ of *Anopheles* and this worm is a free-living worm in its adult stage, while its immature stages are parasitic. Six species of *Anopheles* have been found infested with this worm. The immature worm is very small at the commencement of its parasitic life and lives within the body cavity of the larva below the alimentary canal. It grows very rapidly so that by the time mosquito larva reaches its fourth stage, it is nearly six times the length of the host and lies coiled up several times within the body. It finally ruptures the body wall and escapes into the water, thereby killing its host at once. In the moist soil the worm undergoes further development.

The other form is present in the adult mosquito and when it emerges out of the body of the anopheles it is many times longer than the adult mosquito. The infestation starts evidently from the larval stage and the parasite passes through the pupal and adult stages. The life-history of this worm has not been fully worked out.

**148. The Classification and Identification of the Members of the Genus *Phlebotomus*, with some Remarks on their Geographical Distribution in Relation to Disease. Sinton, J. A., Major, V.C., I.M.S.** (*Director, Central Malaria Organisation, Kasauli*).

The males of the genus *Phlebotomus* are easily identified in the majority of species by the morphology of the external genitalia but in the past the identification of the females has been a matter of great difficulty and considerable uncertainty.

*Older Methods of Identification.*—In the males the morphology of the external genital armature is a reliable characteristic in the majority of species but in the past some closely allied species have been confused.

The identification of the females has depended on such uncertain features as the known geographical distribution, naked-eye appearances, wing venation and the relative lengths of the different appendages, such as palpal and antennal formulæ, etc.

*More Recent Methods of Identification.*—It has been found that the genus *Phlebotomus* is divisible into two main groups (A) those species which have some erect hairs on the dorsum of the abdominal segments, in addition to those on the first segment and (B) those in

which all the hairs on the dorsum of the abdomen are recumbent, except those on the first segment.

Group A. The "erect-haired" group.

In addition to the erect hairs all the members of this group are characterised by the fact that the female spermathecae have a crenulated outline.

Two main subdivisions can be made of this group:—(a) those in which the erect hairs on the dorsum of the abdomen are numerous and (b) those in which these hairs are scanty.

Subdivision (a). Here in the majority of species the morphology of the male genitalia and of the female spermathecae are characteristic, but where doubt still exists the markings at the posterior end of the pharynx afford considerable help. In this subdivision the bucco-pharyngeal junction is usually simple and untoothed. (Examples, *P. papatasi*, *P. argentipes*, etc.) Subdivision (b). Although in many cases it is possible to identify with certainty the members of this subdivision by an examination of the external genitalia of the male and the spermathecae of female, one has usually to confirm the identification by an examination of the buccal cavity and pharynx. At the junction of these two structures there is, in most cases, a row of teeth and a dark area of chitin—the "pigmented area." The morphology of these seems to be characteristic of the species and differs markedly from the simple nature of this region in subdivision (b). The palpal formulæ, wing venation, etc., are of secondary value. (Examples, *P. hospitii*, *P. christophersi*).

Group B. The "recumbent-haired" group.

While some of the males of the species in this group have genitalia, which show specific characteristics, many others cannot be thus identified. The spermathecae of the females of this group has a smooth outline, which is markedly different from the crenulated appearance seen in Group B. The structures are less highly chitinised and are therefore liable to distortion. They have been found of little value in specific diagnosis.

In this group the morphology of the bucco-pharyngeal junction is of the greatest diagnostic importance and has greatly simplified identification. Aid is also afforded by the palpal formulæ, wing venation, etc. (Examples, *P. minutus*, *P. montanus*, etc.).

*The Geographical Distribution of "Sandflies" in relation to disease.*—Observations on the geographical distribution of these insects in relation to the distribution of phlebotomus fever, kala-azar and oriental sore.

**149.** The Breeding of Sandflies in Nature and in the Laboratory. **Smith, R. O. A.**, Assistant Surgeon, D.T.M., I.M.D. (*School of Tropical Medicine and Hygiene, Calcutta*).

*Breeding in Nature.*—The reports of occasions when *Phlebotomus* larvæ have been found in nature, are remarkably few considering the prevalence of this genus, and their importance in Medical Entomology.

The larvæ of *P. minutus* have been found by Howlett in Pusa, and Mitter in Lahore. Those of *P. papatasi* by Mitter in Lahore, and

McCombie Young, Richmond and Brendish, in the Peshawar District. Larvæ of *P. argentipes* have been found by the author in Calcutta, and Raman in Madras. Newstead, Grassi and Marett have found larvæ in Malta, and King in the Soudan.

The flies have been found breeding in a variety of situations, in highly manured soil, as well as in the earth of borrow-pits and railway embankments.

The suspected material was examined directly with a hand lens, or under a simple microscope; treated by the special method of McCombie Young, Richmond and Brendish, or kept in a suitably covered vessel and all emerging diptera examined.

Each method has its advantages—when the amount of material collected is small, the direct method is simplest, and takes very little time. If the amount of material is large, and time and staff available, the method of McCombie Young and his collaborators would be most satisfactory. If not, the last method could be practised.

Larvæ migrate freely in search of food and suitable conditions of moisture and temperature, and the number of larvæ found in a uniform sample depends on the amount of material collected.

In addition to larvæ of different sizes, pupæ also have been found in the same sample, showing that successive batches of ova have been laid in a given area from time to time.

*Breeding of Phlebotomus in the Laboratory.*—To breed any given species of *Phlebotomus* for experimental purposes it is well to begin by caging single females in suitable receptacles, collect the ova of each fly separately, and hatch them out.

Females of *P. argentipes* breed in the laboratory oviposit readily in a test tube after a meal of blood, provided they are kept at the correct temperature, and given a sufficiency of moisture. Wild flies do not oviposit as readily under the same conditions, and do better in a chimney suitably arranged with damp cotton-wool or filter paper.

Ova may be washed or brushed with a fine camel-hair brush into a breeding pot made of unglazed earthenware lined with a thin layer of plaster-of-paris. This pot is kept moist by being placed on damp cotton-wool or sand or filter paper. Crushed faeces of rabbits is placed in the pot in the spaces between the ova, and the whole kept at a temperature of between 28—30°C. which has been found to be the optimum temperature for breeding.

Larvæ feed on any form of decomposing nitrogenous matter. In the laboratory we have fed them on crushed faeces of rabbits mixed with dried blood. The amount of moisture allowed is important. The pot in which ova and young larvæ are present should feel damp to the touch but there should be no free water. Older larvæ require less moisture and pupæ practically none.

As soon as pupation is observed in any pot, that pot is placed in a breeding-out cage and the adults caught from the cage are used as required. They should have an opportunity to feed during the first 48 hours of life otherwise they die.

*P. minutus* and *P. squamipleuris* have been bred out successfully using the above technique.

For *P. papatasi* the method described by McCombie Young and his collaborators has given the best results. An earthenware pot half filled with mule litter is covered with mud and a crucial incision made in the mud. The pot is now allowed to dry till the mud hardens. This pot is stood in a tray of water and the tray and pot placed in a muslin cage into which *P. papatasi* are introduced. Ova are laid in the deep layers of the food material and the larvæ hatch out "in situ" and develop uninterruptedly.

Pots in which sandflies are being bred should be protected from a species of mite belonging to the family Gamasidæ. These mites destroy the ova and young larvæ. Ants too destroy the larvæ. Certain other rapidly developing larvæ like those of the Mycetophilidæ by feeding on the available food, starve out the *Phlebotomus* larvæ.

A certain number of sandflies in nature are found infected with gregarines—*Monocystis mackiei* (Shortt and Swaminath, 1927), but these do not seem to influence the life history of the fly however heavily the fly may be infected.

On the other hand a species of nematode which has been found infecting *P. argentipes* causes the death of the fly either during the 1st or 2nd oviposition. The larvæ of this nematode which are hatched in the cœlomic cavity of the fly infest the ovaries, and probably by blocking the oviduct prevent oviposition and thus cause its death.

**150.** Some Anopheles of Sarawak. **Stokes, V. A., M.C., B.Sc., M.B., D.T.M. and H. (Miri, Sarawak).**

*Anopheles* found in Sarawak; list published in 1914. The papers of Roper (1914) and Scharff (1927) on Anopheles of neighbouring parts of the West Coast of Borneo.

*Miri.* Geographical position, climate, soil, natural features, malaria.

*Anopheles brevipalpis*, Roper. Adults scarce, larvæ not found. Relation to malaria not determined. Not previously reported from Sarawak.

*Anopheles barbirostris*, v. d. Wulp. Formerly abundant, now not common. Breeding places. Results of dissections negative, although ludlowi from same place infected.

*Anopheles umbrosus*, Theo. Formerly abundant in certain places, now hardly ever seen. No record of any connection with malaria when found alone.

*Anopheles sinensis*, Wied. (hyrcanus, Pall.).

*Anopheles separatus*, Leic. Doubt as to which is found, perhaps both? Adults resemble separatus, but there are two distinct types. Details of types; one with smaller and darker wing than the other, also different palpal markings; neither has scale tuft on abdomen. Larvæ resemble hyrcanus in most points. Breeding places.

*Anopheles albotanaiatus*, Theo. Few specimens bred from larvæ. Breeding places; association with *leucosphyrus*. Relation to malaria not known. Hitherto not reported from Sarawak.

*Anopheles ludlowi*, Theo. Previously unknown in Sarawak. Occurs in large numbers and is principal malaria-carrier. Seasonal

variation, with consequent variation in malaria. Breeding places. Methods of combating; anti-larval measures; catching engorged females in cooly-lines; removal of infective human carriers by periodic blood examination and treatment. Investigation of cause of seasonal variation; its independence of rainfall, temperature and humidity; its possible connection with salinity of breeding places; influence of high spring tides in this respect; chart of tides and mosquitoes, showing relation between them. Possibility of using salt water to control *judlowi*.

*Anopheles leucosphyrus*, Don. Always found in one locality. Adults constantly in dwellings. Larvæ only found in clean water after heavy rains. Relation to malaria definite, although engorged females did not survive long enough for dissection.

*Anopheles tessellatus*, Theo. Differ from Australasian punctulata. Irregular breeding season; types of breeding places, including artificial containers. No definite connection with malaria.

*Anopheles kochi*, Don. Very common, but adults not often found in houses. Numbers increase with rainfall. Breeding places; sunlight essential; associated species. Only once found in connection with malaria, but no dissections done and umbrosus also present, so no conclusive evidence.

*Conclusion.* *A. maculatus* and *karwari* not found, although former is known elsewhere in Sarawak and in North Borneo.

## HELMINTHOLOGY.

**151.** *Filaria malayi* n.sp. parasitic in Man in the Malay Archipelago. **Brug, S. L.,** Colonel, Dutch East Indies Medical Service (*Director, Geneeskundig Laboratorium, Weltevreden*).

Until recently it was generally accepted that in Dutch East India only one *Filaria* species (*F. bancrofti*) occurred as a human parasite. Close examination of microfilaria specimens from Sumatra, Celebes and Pantar (Lesser Sunda Islands) showed that in these islands another hitherto undescribed *Filaria* occurs. Its larvæ (microfilariae) agree with those of *F. bancrofti* in showing a long sheath and nocturnal periodicity, but they are different from the latter in two respects:

1. The point of the tail is not wholly devoid of nuclei, but contains 2 or 3 scattered nuclei; one of them occupies the apex of the tail.

2. The excretory pore occupies a more anterior position than in *microfilaria bancrofti*.

As far as evidence goes, this microfilaria does not develop in *Culex fatigans*.

**152.** Recent work on Schistosomiasis. **Fairley, N. H., M.D.** and **Mackie, E.P.,** Lieut.-Col., O.B.E., I.M.S. (*Haffkine Institute, Bombay*).

1. *S. spindalis* infection in animals.
2. Morbid anatomy.

3. Methods of infection.

4. Serology.

\* 5. Treatment.

**153.** The Correlation between the size of Hookworm Egg Counts and the Degree of Anæmia in Two Groups in Southern India. Dr. **Kendrick, J. F.**, M.D., D.P.H. (*Rockefeller Foundation*).

**154.** The Relation of Ankylostome Infestation to the Physical Features of an Agricultural Area in India and to the Social and Economic Status of its Population. **Korke, V. T.**, F.R.C.P. (Edin.), D.T.M. (L'pool). (*Helminthological Enquiry, Indian Research Fund Association, Bihar and Orissa*). \*

**155.** The Correlation between Ankylostome Disease and Hæmoglobin Value as obtained in regard to the Physical Features of an Agricultural Area in India and to the Social and Economic status of its Population. **Korke, V. T.**, F.R.C.P. (Edin.), D.T.M. (L'pool). (*Helminthological Enquiry, Indian Research Fund Association, Bihar and Orissa*).

**156.** Prevalence of Filariasis in some areas in British India. **Korke, V. T.**, F.R.C.P. (Edin.), D.T.M. (L'pool). (*Helminthological Enquiry, Indian Research Fund Association, Bihar and Orissa*).

**157.** Some Cases of Strongiloidosis and the Treatment with Gentian Violet. Dr. **Kwa Tjoan Sioe** (*Wetlevreden, Java*).

I. There is a divergence of opinion as to the pathogenity of Strongiloidosis. In some cases this pathogenity can not be doubted.

II. No success can be expected in the treatment of Strongiloidosis with the common Vermifuges.

III. Gentian-violet tablets taken per os kill the worms, although the larvæ are not more influenced by a solution of this drug than by other solutions of the known vermifuges.

**158.** Les Helminthiases a Pondichery (Etablissements français dans l'Inde. **Labernadie, V. G. F.**, Major (*Chef du Laboratoire de Pondichery, Etablissements français dans l'Inde*).

I. Index parasitaire en général:

Nombre de parasites

Nombre d'examinés.

II. Index parasitaire absolu:

Nombre total d'espèces

Nombre d'examinés

III. Fréquence des espèces par rapport:

(a) au nombre des examinés.

(b) au nombre des parasités

VI. Pluriparasitisme et associations parasitaires.

V. Prophylaxie et traitement.

**159.** Ento-Parasites found in the Tarabagan. Dr. **Li Yuan Po** (*Parasitologist, Manchurian Plague Prevention Service*).

1. Introduction.



2. Description of species found:
  - (a) *Ascaris* sp.
  - (b) *Enteromonas* sp.
  - (c) *Entamoeba* sp.
3. Detailed study of *Enteromonas* sp.
  - (a) Morphology.
  - (b) Cultivation.
  - (c) Pathogenicity.
4. Conclusion.

**160.** Filarial Infection and Diseases due to *Filaria bancrofti* in Calcutta. **Sundar Rao, S.,** L.M.P. (Madras), (*Dharbanga Scholar, School of Tropical Medicine and Hygiene, Calcutta*).

1. 10 per cent. of the population of the city of Calcutta show microfilariae in their blood.

2. The distribution of the infection in the city in general with a tendency to a higher percentage in congested localities.

3. Filarial fever is the commonest manifestation of the infection.

4. The other lesions of the diseases seen in Calcutta are:—Elephantiasis; Orchitis, Chyluria and Abscess; less frequently lymph-scrotum, lymph-adenitis and lymphatic varix.

5. *Culex fatigans* is the chief mosquito intermediary host in Calcutta.

**161.** Notes on a Quantitative Hookworm Survey of Ceylon. **Sweet, W. C.,** M.D., C.P.H. (*International Health Division, Rockefeller Foundation*).

Hookworm infection in Ceylon was found to be widespread, about 90 per cent. of the population being infected. Quantitative estimations of this infection showed that the average intensity per person was only 2,200 eggs per gram, basis formed faeces, approximately 100 hookworms. As compared to results reported from other parts of the tropical world, this was a rather low grade infection. The long dry season of the north, the excessive rainfall of the south and the results of hookworm control work were possibly responsible for this, in varying proportions.

The average egg-counts per gram of the children from seven to fourteen years of age were found to be numerically equal to those found amongst adults, making it possible to estimate adult averages by examining school children, where no control work had invalidated the relationship.

A study of the distribution of the infection in the population of two provinces, in which the average intensity per person was 2,800 eggs per gram, showed that but 53 per cent. of the people had what Smillie classified as hookworm disease, the remainder being merely carriers of worms. It was possible, then, to consider the hookworm problem of the island as a whole as one in which 50 per cent. approximately, of the people had hookworm disease, rather than as one in which 90 per cent. were infected.

The relatively high infection of the children, the habits and customs of the people, the fact that night-soil was not used as a fertilizer, to any extent at least, and the general lack of latrine accommodation made it seem clear that hookworm infection in Ceylon was acquired from soil pollution around the living quarters of the people. Against this was the relatively high intensity of infection among adult males engaged in rice cultivation, an intensity about 35 per cent. higher than that of the surrounding population.

**162. Preliminary Observations on Ankylostomiasis in Pariah Dogs. Dr. Thapar, G. S. (Lucknow):**

In the course of my investigation on the Helminth Parasites of Pariah dogs in Lucknow, I came across a few Nematode worms from its intestine, along with a large number of Cestodes. These worms, on examination, turned out to be *Ankylostoma duodenale*. Although its presence has been recorded from "*Felidae*," so far as I am aware, this parasite has not been reported from pariah dogs in India. This led me to a further examination of a number of dogs, and all of them were found infected with the same parasite, the host, however, showing the usual symptoms of weakness, etc. It further indicates that pariah dogs being so common an associate in our homes, its agency in the spread of the hookworm disease in man cannot long be ignored.

**163. Present Status of Sauricola and Echinopharynx. Dr. Thapar, G. S. (Lucknow):**

Chapin (1924) described *Sauricola*, a new genus of Nematode worms, from the intestine of *Testudo denticulata*. Later, the writer (1925) described another new genus, *Echinopharynx*, from the same host. The validity of the latter has been doubted by Yorke and Maplestone (1926) who regarded it as a synonym to *Sauricola*. These authors, however, have not given any reasons for doing so and have further put up a confusion in mixing the accounts of both the genera into one. Through the courtesy of the United States National Museum, the writer has had the opportunity of examining some of Chapin's materials, and finds that Yorke and Maplestone were not justified in fusing the two genera into one. An account of *Sauricola* is added with a view to bring out the prominent features in which the two genera differ from one another, thus establishing the validity of erecting a new genus, *Echinopharynx*, by the present writer.

## NUTRITION.

**164. A Preliminary Note on the Inter-relationship of some of the Endocrine Glands in Sugar Metabolism. Bose, J. P., M.B., F.C.S. (Lond.), (Diabetes Research Worker, School of Tropical Medicine and Hygiene).**

It has been found that animals of the same genus but of different species and colour behave quite differently to the same dose of Insulin. The albino himalayan rabbits were found to be least susceptible to Insulin while the Brown Belgian hare was extremely susceptible to

the same dose of Insulin per kilo of body weight. The jet black rabbits came intermediate.

In finding out the cause as to why such variability should occur, attention was directed to the function of the adrenalin glands in these different rabbits. In a previous experiment it was found that small doses of adrenalin were capable of producing hyperglycæmia in rabbits and when adequate doses of both adrenalin and Insulin were given simultaneously to the same rabbit, there was neither a rise nor a fall in the blood-sugar.

With a view to finding indirectly the adrenalin response of these rabbits of different breed and colouration, the effect of injection of adrenalin on blood-sugar was studied, and the result obtained was striking. It was found for instance that the albino himalayan rabbits which reacted so poorly to insulin gave a well marked adrenalin response vice versa, the Brown Belgian type of rabbits which reacted violently to Insulin gave a very poor adrenalin response. These experiments showed to some extent that there is some association between the colour and species of rabbits as regards the output of adrenalin from the adrenalin glands.

It has been experimentally proved that thyroid stimulates the chromophil tissues to increased activity and excess of secretion of thyroid in the blood stimulates the sympathetic system causing an increased outpour of adrenalin. It also seems probable that thyroid exerts a marked inhibitory action on the pancreas and the removal of this influence makes the pancreas more active regarding the insulin function.

To find out whether thyroid had anything to do in this antagonistic action between insulin and adrenalin in the different species of animals, I performed thyroectomy on some of the albino himalayan rabbits which before proved very resistant even to big doses of insulin. Then after a fortnight I tested the Insulin response. Though I have done only a few experiments (which I am still continuing) not sufficient to warrant me to give an absolutely definite opinion, the result I have obtained so far is very striking indeed. The same animals which were very resistant to Insulin before, had severe reactions after the same dose of Insulin which was given to them before and two of them died with typical hypo-glycæmic coma. The adrenalin response was also poor compared to what they gave before they were thyroidec-tomised.

Extending the experiments regarding the antagonism between insulin and adrenalin on human subjects it has been found that cases with loss of pigmentation such as Leucodermas show a high adrenalin response and a low insulin response (comparable to the albino rabbits). On the other hand cases with increased pigmentation such as Chloasmas, Kala-azar, etc., show quite opposite results.

**165.** The Experimental Production and Prevention of Stone-in-the-bladder in Rats. **McCarrison, R.**, Lieut.-Col., C.I.E., M.D., F.R.C.P., I.M.S. (*Director, Deficiency Diseases Enquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

Stone-in-the-bladder and its sequelæ—cystitis, dilated ureters, hydronephrosis, pyonephrosis, pyelitis—have been produced in rats by means of diets composed of food-stuffs in common use in India, (whole wheat flour, oatmeal, patent flour, linseed meal and white flour). It is preventable by adding milk to the stone-producing diets. It appears to be due to relative deficiency of Vitamin-A in the diet.

**166.** Relative Values of National Diets of India. **McCarrison, R.**, Lieut.-Col., C.I.E., M.D., F.R.C.P., I.M.S. (*Director, Deficiency Diseases Enquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

The relative values of certain national diets of India (Sikh, Pathan, Mahratta, Goorkha, Kanarese, Bengali and Madrassi) have been studied by biological assay on rats. The nutritive values of these diets range themselves in the above order: the Sikh diet being the best, the Madrassi diet the worst. Differences in the nutritive value of these diets are correlated with their content of suitable protein, mineral elements and vitamins. The distribution of such diseases as leprosy is thought to be related to the nutritive value of the diets of Indian races.

**167.** Effect of Manganese on Growth. **McCarrison, R.**, Lieut.-Col., C.I.E., M.D., F.R.C.P., I.M.S. (*Director, Deficiency Diseases Enquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

Small amounts of manganese such as are normally present in whole-wheat are favourable to growth when added to synthetic diets complete in all other respects. Larger amounts exercise a deterrent effect on growth. White flour and polished rice are deficient in manganese.

**168.** Effects of Faulty Food Deficient in Vitamins on the Gastro-intestinal Tract. **McCarrison, R.**, Lieut.-Col., C.I.E., M.D., F.R.C.P., I.M.S. (*Director, Deficiency Diseases Enquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

These effects are: (1) Degenerative changes in the mucous membrane amounting in some cases to ulceration. (2) Depression of digestive and assimilative processes. (3) Failure of the neuro-muscular control of the bowel. (4) Loss of lymphoid elements. (5) The production of new growths in the stomach, and (6) greatly increased susceptibility of the tract to infection by bacterial and protozoal agents (such as by *Entamæba histolytica*). These effects manifest themselves clinically as gastritis, catarrh (mucous disease), dyspepsia, diarrhoea, dysentery, constipation and gastro-intestinal stasis.

**169.** Vitamin Content of Whole Rice. **McCarrison, R.**, Lieut.-Col., C.I.E., M.D., F.R.C.P., I.M.S. (*Director, Deficiency Diseases Enquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

Whole rice is fundamentally poor in vitamins. Its content of these substances is further reduced by parboiling, milling, polishing

and washing. The frequency with which beri-beri occurs in rice-eating races is due to this fundamental poverty of the whole rice grain in vitamins.

**170. New Growths in the Stomach of Deficiently-fed Rats.** **McCarrison, R.**, Lieut.-Col., C.I.E., M.D., F.R.C.P., I.M.S. (*Director, Deficiency Diseases Enquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

New growths in the proximal portion of the stomach have been observed to occur in rats fed on certain deficient diets. The growths were of papillomatous nature. No definite evidences of malignancy have been found in them.

**171. A Note on Iodine Metabolism.** **Newcomb, Clive**, Major, D.M., F.I.C., I.M.S. and **Sankaran, G.**, M.B., B.S. (*Madras*).

Determinations of the iodine in the urine of a person on a constant diet adequate in iodine, have shown that within the somewhat considerable error of the experiments:—

(1) The concentration of iodine in the urine is constant over a short period.

(2) The total daily excretion of iodine in the urine varies directly with the quantity of urine passed.

(3) Of small amounts of iodine (1 to 2 mgs. as KI) added to the diet about 40 per cent. is recovered in the urine in the subsequent twenty-four hours, and about 60 per cent. in all.

**172. Basal Metabolic Rate for Indians.** **Sokhey, S. S.**, Major, I.M.S. (*Assistant Director, Haffkine Institute, Bombay*).

A study of the basal metabolic rate has been made for Indians and the figures obtained are compared with those for Europeans.

## DEFICIENCY AND ENDOCRINE DISEASES.

**173. The Causation of Lathyrism by *Vicia sativa*.** **Acton, H. W.**, Lieut.-Col., I.M.S. (*Professor of Bacteriology and Pathology*) and **Chopra, R. N.**, Major, M.A., M.D. (Cantab.), I.M.S. (*Professor of Pharmacology*) (*School of Tropical Medicine and Hygiene, Calcutta*).

In 1922—1924 we were investigating this disease, which we considered was due to eating khesari dāl or *Lathyrus sativa* that had germinated during the monsoon months. Howard, Simonsen and Anderson considered that the disease was due to *Vicia sativa*, a weed that grew along with the dāl in the fields. They showed very marked toxic effects in animals when fed on this seed, and considered that these were produced by the alkaloid divicine. Their results did not at first sight appear convincing, as they used too large a quantity of the grain in their feeding experiments, and produced complete paralysis usually followed by death of the animal. In lathyrism the paralysis affects the lower limbs and the disease is not fatal. Our error arose from the fact that we were not botanists, for the vicia seeds found as a contamination, were identified for us as *Wightiana coagulans*, a grain which is not toxic and contains an enzyme-like rennet. Moreover,

in the non-germinating seed obtained in Rewah there was practically no vicia seeds present, whilst in the specimen from Bhagalpore which readily germinated about 1 gramme of vicia seeds were present per litre of dāl. The poisons we isolated from the germinating grains produced symptoms identical with lathyrism in man and was due to this small contamination of vicia sativa in the khesari dāl.

Investigating the subject afresh, we were unable to produce symptoms of lathyrism in the ducks fed on khesari dāl, whether it was germinating or non-germinating provided it was freed from vicia seed. Moreover, the bases extracted from pure khesari dāl in a similar manner were not toxic to guinea-pigs. In sorting out different samples of khesari dāl in the market, we found that the grains that were not allowed to fully ripen (non-germinating) usually had no akti seeds along with them, but the grains that were gathered ripe (germinating) very frequently had akti seeds present, the amount varying from  $1\frac{1}{2}$  to 2 grammes per litre of khesari dāl. The variation in toxicity of this dāl is known to the villagers in these areas, and has been noticed by several workers, Stockmann, ourselves, etc., and this we now show is due to the amount of vicia sativa present and not to any differences in the Lathyrus sativa grains. The difference in the symptoms produced in animals by us and those produced by Howard, Simonsen and Anderson were due to the small amount of divicine used by us and the larger amounts used by them. We have therefore confirmed their work, which has made the prevention of lathyrism an easy problem to deal with in these districts.

**174.** Prophylaxis and Cure of Beri-beri by Vitamin-preparations. Dr. **Jansen, B. C. P.** and Dr. **Donath, W. F.** (*From the Chemical Department Medical Laboratory, Weltevreden, Java*).

In a general way we must advise people to choose their food in order to get enough vitamins and not to buy vitamins separately. For rice, however, we should make an exception as unpolished rice is not an article of trade, because it deteriorates very quickly. Therefore people in large towns, who cannot pound their own rice, are obliged to buy polished rice and are in danger of getting beri-beri. Consequently it should be important to obtain a product which contains the necessary vitamin in a very compact form. This preparation should further be durable, tasteless, colourless, inodorous, and above all very cheap. The vitamin now being isolated, this pure vitamin would in the most perfect way fulfil these conditions, except the last. Probably the vitamin will also become very cheap, when it can be made synthetically. This stage, however, not having been reached so far, the Medical Laboratory in Weltevreden, Java, has started some preparations, which fulfil all the conditions mentioned above. The costs do not exceed half a cent. (=  $\pm 0.1$  penny) per man daily.

**175.** Beri-beri Columbarum. **McCarrison, R.**, Lieut.-Col., C.I.E., M.D., F.R.C.P., I.M.S. (*Director, Deficiency Diseases Enquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

True beri-beri (cardiac enlargement and degeneration, neuritis and oedema) has been produced under experimental conditions in

pigeons. It differs from *polyneuritis columbarum* ("rice disease") in the enlargement and degeneration of the heart which accompanies the true beri-beri state. It is due to an insufficiency in the food of the anti-neuritic fraction of vitamin-B but not to a complete want of this vitamin. Complete deprivation of vitamin-B causes polyneuritis; it rarely causes true beri-beri. There is an optimum state of vitamin insufficiency at which true beri-beri occurs. It has been demonstrated by statistical and pathological methods that there is a specific beri-beri-producing factor which arises in the body in consequence of certain degrees of vitamin-insufficiency. *Beri-beri columbarum* is not due to toxic substances contained in deteriorated rices.

**176.** Lymph-Adenoid Goitre. **McCarrison, R.**, Lieut.-Col., C.I.E., M.D., F.R.C.P., I.M.S. (*Director, Deficiency Diseases Enquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

This type of goitre is the hypertrophic reaction of a physiologically insufficient organ with which there occurs a preponderance of lymphatic aggregates, fibrosis and a peculiar atrophy of the parenchyma. It is common in man. It has been produced under experimental conditions in rats by means of diets into which white flour enters largely and from which green vegetables and fruit are absent. It is due to insufficiency of the Beta-fraction of Vitamin-B. It is unrelated in its origin to iodine.

**177.** Relationship of Iodine to the Endemic Goitre of Himalayan India. **McCarrison, R.**, Lieut.-Col., C.I.E., M.D., F.R.C.P., I.M.S. (*Director, Deficiency Diseases Enquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

The endemic goitre of Himalayan India is the classical or chronic hypertrophic type of the disease. Its essential cause is the unhygienic conditions of life of the people. Among these conditions bacteriological impurity of their drinking-water and of their surroundings is the chief. A deficiency of iodine (in the soil, water and food) relative to these conditions of life is favourable to the development of the disease though not the essential cause of it.

**178.** Salt Licks. **Newcomb, C.**, Major, D.M., F.I.C., I.M.S. (*Chemical Examiner to Government, Madras*).

From analyses of the soil from seven salt licks in Southern India, it is shown that, whatever it is, that the wild animals seek in these places, it is not sodium chloride. Further, it is improbable that the animals seek either calcium or iodine. The reason for the animals going to these salt licks remains a mystery, and the writer asks for assistance in collecting more material.

**179.** Epidemic Dropsy: its bearing on the Beri-beri Problem. **Megaw, J. W. D.**, Lieut.-Col., C.I.E., I.M.S. (*Director, School of Tropical Medicine and Hygiene, Calcutta*).

**180.** Index of Beri-beri Preventing Rice, **Vedder, E. B.**, Lieut.-Col., Medical Corps, U. S. Army (*Medical Department, Research Board, Manila*).

## IMMUNOLOGY AND CHEMICOTHERAPY.

**181.** The Relation between Chemical Constitution of Antimonials and their Therapeutic Properties. **Brahmachari, U. N.**, Rai Bahadur, M.A., M.D., Ph.D. (*Calcutta*).

In this paper the relationship of chemical constitution of the following antimonials to their therapeutic properties are discussed :—

- (1) Metallic antimony.
- (2) Antimony trioxide.
- (3) Antimonyl tartrates and Malates.
- (4) Acetyl-p-amino-phenyl-stibinate of sodium.
- (5) P-amino-phenyl-stibinate of sodium.
- (5) Urea-para-stibanilate.
- (7) Ammonium-carbamino-stibanilate.
- (8) N-phenyl-glycine-amide-p-stibinate of sodium.

**182.** Chemotherapy of Bubonic Plague. **Caius, J. F.**, Rev. Father, S.J., F.L.S., M.S.C.I. (Paris), and **Naidu, B. P. B.**, M.D., M.H., D.T.M., D.P.H. (*From the Haffkine Institute, Bombay*).

A. The bactericidal action of various chemicals on *B. pestis* in vitro.

- (a) Phenols.
- (b) Substituted phenols.
- (c) Mercurated phenols.
- (d) Phthaleins.
- (e) Dyestuffs.
- (f) Mercurated dyestuffs.

B. The therapeutic value of certain of these substances in vivo.

**183.** Studies on the Physical Properties of Normal and Pathological Sera. **Chopra, R. N.**, Major, I.M.S. and **Chaudhury, S.** (*From the Department of Pharmacology, Calcutta School of Tropical Medicine and Hygiene*).

The hydrogen-ion-concentration of sera has been determined by the hydro-quinhydrone method and their viscosity, gold number, conductivity and iso-electric point have been carefully worked out. There is a slight drift of pH to the alkaline side in the case of kala-azar sera. Viscosity of kala-azar serum is also a little increased, while no appreciable difference can be recognised in the values of gold number and conductivity. The iso-electric point of kala-azar serum is definitely more alkaline than those of other sera. Incidentally, the precipitation produced by kala-azar sera with organic compounds of antimony can be explained on the basis of these physical constants. The coagulation value of these sera with  $\text{Al}_2(\text{SO}_4)_3$  and  $\text{FeCl}_3$  have also been determined. Gel formation with  $\text{Al}_2(\text{SO}_4)_3$  has also been studied. It has been found that the concentrations of  $\text{Al}_2(\text{SO}_4)_3$  at which leprosy and kala-azar sera form gels are distinctly different from those of the other sera. Explanation on the basis of the change of concentration of different proteins has been suggested. Experiments are being conducted to elucidate and correlate all these precipitations with electrolytes in the case of different sera.



**184. Development and Duration of Immunity by Inoculation and Re-inoculation. Harvey, W. F.,** Lt.-Col., C.I.E., I.M.S., and **Iyengar, K. R. K.,** Captain, I.M.S.

In a series of papers (1921 to 1923) we published the results of our work on the duration of potency of fowl cholera vaccine, taken as a type, and on the duration of immunity produced. In all our experiments we have made an endeavour to give as complete a picture of the course of events as possible by making trial of protection effect, by the administration of living virulent organisms, dose by dose, rather than confining ourselves to the use of minimal lethal doses only. In this way a picture of the protective effect is given which is much more convincing than any attempt to define the minimum lethal dose. One of the last of these papers was of considerable importance from the point of view of vaccino prophylaxis generally. It dealt with the use of doses very much smaller than the original immunising doses, to restore immunity to the original level. In other words it brought forward the suggestion, supported by experiment, that re-inoculation might be performed with minimal doses only, and yet be effective. The underlying idea was that although the animals which had been prophylactically immunised showed complete loss of their immunity to test doses, they were not identical with animals which had never been immunised at all; they were sensitive to doses much smaller than non-immunised animals and reacted to very small doses in the sense of developing a high degree of immunity. With an extension of the idea of this sensitiveness to small doses, we contemplated making the general statement. An animal once immunised is always immunised. Such a statement would only be justifiable of course in a special sense and requires further proof. Owing to the inability of the authors to continue their experiments, the further test of duration of the immunity brought about by the use of small doses in animals, which had once been immunized but were no longer protected under the conditions of the test, could not be carried out. This opportunity has now come and we give the results of trials intended not only to demonstrate the point which was not tested before but to confirm and amplify results already obtained. In this trial 600 pigeons received inoculation and then served at stated intervals for the test of protection. In our former experiments we used arbitrary first and second prophylactic doses of 0.35 and 0.7 mgm. In these we utilized the information gained in trials of the optimum size of prophylactic dose (1923) and have used doses of 0.04 and 0.08 mgm. The results, while they generally confirm those previously obtained, show that with such a smaller first dose proven to be of full immunising value in conjunction with the second dose, we have obtained a certain amount of protection by the use of a single dose only. In the first set of experiments we were not able to show any protection to have developed as a result of the use of one prophylactic dose only. Not till the second prophylactic dose had been administered was protection evident. In this series protection is evident after a single prophylactic dose although not of the high degree which is evident after the administration of the second dose. This difference between the two trials may have been due to the present use of an optimum *minimum* prophylactic dose as against

an arbitrary dose which was demonstrably larger than necessary. A certain amount of temporary depression of the mechanism of immunity (negative phase condition) may have resulted from the use of the too large dose. On the other hand, the difference may be only an accidental variation, such as is bound to occur in experiments of this nature. We may leave the matter there but so far revise our former finding by maintaining that a single prophylactic dose of vaccine can effect immunisation, although to a less degree than is effected by two spaced and suitable prophylactic doses.

*Development and Duration of Protection.*—The results now obtained are to be compared with those previously given by us (1923, *Indian Journal of Medical Research*, X, 4, p. 990 and p. 1147). We conclude that (1) evidence of protection is manifest 7 days after with a single dose of prophylactic antigen; (2) development of immunity reaches its maximum about the 14th day after the administration of a second dose of prophylactic antigen; (3) evidence of a high degree of protection is manifest for 4 months and of almost complete loss of protection 6 months after inoculation of antigen; (4) agglutination titre does not correspond to protection.

*Duration of Protection after Re-inoculation.*—The animals used for the test were the pigeons left over out of the 600 after our experimentation on the duration of immunity had come to an end. These pigeons showed marked immunity for 4 months after prophylactic dosage and had lost that immunity at the end of 6 months. These animals were no better protected than the control uninoculated pigeons except that they were at one time highly protected. The doses used for re-inoculation were .04 mgm. followed 7 days later, with .08 mgm. as in the original inoculation and 1/4th, 1/8th, 1/16th and 1/32nd of these doses. Tests for evidence of protection were carried out at definite intervals as in the primary prophylactic inoculation.

Animals receiving 1/4th and 1/8th the original dose showed as high a degree of immunity as those receiving the full dose. The immunity lasted for 5 months. In the case of 1/16th and 1/32nd doses, the protection begins to fall.

We conclude that (1) complete immunization of animals can be effected with doses of antigen very much smaller than the lowest optimum prophylactic dose originally administered and this immunity lasted for 5 months; (2) what applies to fowl cholera vaccine may apply to other vaccines as well.

**185.** On Some Factors Influencing the Therapeutic Value of Salvarsan Solution. **Hata, S.**, M.D. (*Professor of Microbiology, Keio-Gijiku University Medical College and Member of Central Board of Health, Home Dept., Kitasato-Institute, Tokyo, Japan*).

In the practical use of salvarsan especially of neosalvarsan, various substances of divergent purposes are sometimes simultaneously employed. Will these substances be indifferent for the toxicity or the therapeutic value of salvarsan? This problem has not yet been decided by any systematic experimental investigation, which I deemed to be of certain importance. Dr. Komatsu in the Chemotherapeutic Department of the

Kitasato Institute is, by my suggestion, carrying out experiments on the small animals to determine what would be the changes of the toxicity or the therapeutic value of salvarsan when administered either simultaneously or in mixture with various substances, excepting those that are themselves parasiticial, as mercury, bismuth, antimony, etc. Out of the results hitherto obtained, I will communicate only a few factors which influence remarkably the therapeutic action of salvarsan. For instance, the H-ion concentration of the solution has a marked influence over the therapeutic efficacy of neosalvarsan; and the concentration of salvarsan in the solution has a marked influence over the toxicity of "old" salvarsan and the therapeutic value of neosalvarsan. Even these two facts only will require still numerous series of experimental investigation to put forth the theoretical explanation, which I do not mean to do in this communication. It may, however, be worthy to be suggested that from the practical viewpoint these factors are to be especially considered in the technic of the manufacture and in the test of the therapeutic value of salvarsan and its derivatives. I should think from the more practical point of view that these factors would require further minute observation on the clinical application of salvarsans.

**186:** La Syphilimetrie (Méthode de Vernes). **Labernadie, V. G. F., Major** (*Chef du Laboratoire de Pondichery, Etablissement français dans l'Inde*).

1° Principe de la méthode Bordet Wassermann et ses dérivés utilise un système hemolytique dont les variations colorimétriques servent d'échelle pour l'expression des résultats. Tout le monde est d'accord pour constater que cette échelle ne peut se diviser qu'en une dizaine de degrés.

Au moment des découvertes de Bordet et Wassermann et des recherches d'Ehrlich, la théorie en vigueur était une sorte de chimie du sérum où les antigènes, ambocepteurs, alexines s'unissaient suivant certaines lois. Les recherches de ces dernières années se sont orientées vers les états colloïdaux et leur floculation et l'opinion actuelle est que les réactions dites autrefois de fixation du complément sont surtout d'ordre physico-chimique et d'essence colloïdale.

La méthode de Vernes est basée sur l'observation *directe* des troubles colloïdaux des sérums et liquides céphalo-rachidiens pathologiques, non plus par le médium d'un système hémolytique à dix degrés, mais grâce à un photomètre de grande précision et de parfaite sensibilité puisque sa gamme comporte 150 divisions.

Grâce à ce même appareil et à l'utilisation de diverses suspensions colloïdales que l'on prépare avec un "mélangeur" spécial, il est facile:

1°—de faire le diagnostic sérologique de la syphilis dès les tout premiers jours du chancre, c'est à dire bien avant lue le Bordet Wassermann soit devenu positif.

2°—de suivre l'activité sérique de la syphilis et de contrôler le traitement institué sur la courbe formée par les chiffres obtenus au cours des examens successifs.

3°—de surveiller de même le liquide céphalo-rachidien.

4°—de faire le diagnostic sérologique de la tuberculose.

Enfin, le photomètre permet aussi la mesure précise de l'albumine dans le liquide céphalo-rachidien.

## II. Recherches faites à Pondichery.

**187.** Reaction de Wassermann sans étuve. **Labernadie, V. G. F.,** Major (*Chef du Laboratoire de Pondichery, Etablissements français dans l'Inde*).

A partir de 28° C. comme température ambiante, la réaction de Bordet-Wassermann (Méthode de Hecht-Bauer) faite sur le table du laboratoire concorde dans 90 à 95 per cent. des cas avec les résultats obtenu dans l'étuve à 38° C. Pour les besoins de la pratique courante, cette précieuse réaction peut donc être appliquée dans la plupart des dispensaires isolés de l'Inde qui peuvent être munis d'antigène syphilitique, d'eau distillée, d'eau salée isotonique, de quelques tubes et pipettes et qu'ils peuvent se procurer facilement un mouton.

**188.** Some Clinical Aspects of the Wassermann Test (Experience in Calcutta). **Lloyd, R. B.,** Major, M.A., M.B., B.Ch., I.M.S. (*Imperial Serologist*).

The object of this paper is to describe certain aspects of the clinical application of the Wassermann test as used in Bengal. With a reliable technique and adequate controls, the test is as valuable in the East as in the West. The first part of the paper refers to the positive reactions which have been reported in malaria. Some of the earlier reports were based on imperfect technical methods now discarded, and in certain instances the precautions taken to eliminate associated syphilis were clearly inadequate. Excluding certain papers which are defective in these two particulars, the weight of evidence is against malaria being responsible for a positive Wassermann reaction. The writer has specially examined this question, and finds no evidence that malaria causes a positive Wassermann reaction. This is a point of great importance as, were this so, the value of the Wassermann test in India would be in great measure discounted.

Secondly, yaws is a disease met with in India in which a positive Wassermann reaction is found as a regular phenomenon. This is a matter of no great practical importance as the lesions of yaws are characteristic.

The next part of the paper describes the work done during the last four years jointly by Dr. Muir of the Calcutta School of Tropical Medicine and the writer, who have investigated the causation of the positive Wassermann reaction in leprosy, chiefly from the point of view of the effect, clinical and serological, of anti-syphilitic treatment upon such cases. Earlier workers found a high proportion of Wassermann-positive cases in leprosy, and concluded that while syphilis is obviously accountable for certain of the positive fixations, yet there remains a considerable proportion not so due; and which they attributed to leprosy itself. We have examined the Wassermann reaction in the various types of leprosy, and have compared the percentage of positive reactions obtained in a series of over a thousand definitely diagnosed cases with the syphilis rate of the Calcutta hospital population, which is estimated

to be from 15 to 20 per cent. We find in the early or mild types of leprosy, both dermal and neural, that the Wassermann-positive percentage is within this figure; and of twenty-one cases of this class subjected to anti-syphilitic treatment, every one became Wassermann-negative; showing that all these reactions were due to associated syphilis. The case of the advanced dermal types of leprosy is more complex. Here 50 per cent. or more are found to give a positive Wassermann reaction. Of the Wassermann-positive cases in this class, three-fourths respond to anti-syphilitic treatment, the reaction becoming negative. The number of positive reactions met with in these advanced dermal types is found also to depend on the Wassermann technique employed. Kolmer finds with his new method, which has important technical differences from the methods ordinarily employed, that all positive reactions are due to associated syphilis. With what may be called "ordinary" modern techniques, there are, in addition to those due to syphilis, certain reactions which are false positives due to experimental factors. Our own results showing the effect of treatment indicate that a high proportion of positive reactions obtained by "ordinary" techniques in Bengal are due to associated syphilis, which is here present to an extent amounting to two to three times the syphilis rate. The most probable explanation of this is, we believe, that tissues damaged by the syphilitic virus probably form an excellent soil for the advance of the leprosy process; the result of which is that mild cases soon tend to pass into the graver forms of the disease, and, therefore, the Wassermann-positive cases tend to accumulate in this category. Wassermann tests on leprosy cases are now a routine at the Calcutta School of Tropical Medicine; and in the event of a positive reaction being obtained, anti-syphilitic treatment is given in the form of Avenyl, a new mercury compound, administered dissolved in Hydnocarpus oil or Esters. Apart altogether from the change in the Wassermann reaction, the clinical improvement in many cases of leprosy effected by this double treatment is very remarkable. Dr. Muir has found that Wassermann-positive leprosy cases are resistant to anti-leprotic treatment, and a Wassermann-positive patient is never chosen when the effect of any drug is to be estimated.

The next part of the paper refers to the routine use of the Wassermann test in the examination of medical cases in the Calcutta Hospitals. As might be expected, many unsuspected cases of syphilis have been brought to light. Notes of some cases are given which were difficult of diagnosis clinically, and in which the Wassermann test was crucial; the correctness of the Wassermann finding being proved by the disappearance of the symptoms under anti-syphilitic treatment. A few notes are also given illustrating the part played by associated syphilis in preventing or delaying cure in other diseases, e.g., Wassermann-positive kala-azar cases tend to be resistant to specific antimony treatment, and operations for glaucoma may fail in a Wassermann-positive case.

In conclusion, the writer remarks that as the Wassermann reaction has attained its immense reputation by its concordance in an overwhelming proportion of cases with the clinical findings, it follows that the ultimate diagnosis of a case must be made by the clinician, who is

always ready to appreciate the value of a test which, when properly performed, gives almost invariably a correct indication.

**189.** Further evidences on the Lipoidphile Antigen-Antibody Reaction. **Taniguchi, T.** (*From the Government Institute for Infectious Diseases of the Tokyo Imperial University*).

Recent observations on the Forssmann antigen led to the conclusion that lipoids, especially phosphatides, can act serologically as antigen in vitro (the so-called Haptene of Landsteiner). Thus, the Wassermann reagin and the Forssmann antibody are called the lipoidphile antibody (Taniguchi) in contrast to the proteinophile antibody, because the chemical character of antigens corresponding to the former antibody is lipoids, but not proteins.

Further observations on this subject have developed a wide field in serology and immunology. Some interesting facts seem to have been added by workers in our laboratory, to which I wish to refer here.

1. It is known that sera of leprosy frequently manifest the positive Wassermann reaction. According to the work of Murata and Tamiya, the so-called Wassermann reagin which is contained in the sera of leprosy should be separated from the real syphilitic antibody.

2. Results of Nimura's experiment showed that the autohæmolysin or Donath-Landsteiner's antibody of patients of Paroxysmale Hæmoglobinuria may present an example of lipoidphile antibody.

3. Mizumura discovered a new lipoidphile antibody in human sera, which is contained in the serum of blood Group type I (Yansky) and gives rise to the positive complement fixation as well positive precipitation reaction along with the alcoholic extract of human red corpuscles.

4. The author is of the opinion that the hypothesis of Ehrlich which separates the antibody into three groups (Rezeptor I, II, III Ordnung) on account of the different manner of reaction to corresponding antigens is not correct, but the physico-chemical processes which play the principal part in the antigen-antibody reaction are always uniform, because, in the case of lipoidphile antigen-antibody reaction, the single antibody manifests all 3 reactions, i.e., neutralization, precipitation, and complement fixation with the corresponding antigen. The necessity of electrolytes in the medium and the change of electrical charge of antigens is probably the principal factor which explains the mechanism of proteinophile antigen-antibody reaction.

Shibata showed that in case of lipoidphile antigen-antibody reaction also the emigration velocity of the antigen in the electrical field is diminished or deprived of by the presence of the corresponding antibody. Physico-chemical factors played in the lipoidphile antigen-antibody reaction seem to be identical with those manifested in the proteinophile antigen-antibody reaction.

## RABIES.

**190.** The action of Ether on the Rabies Virus. **Cunningham, J.,** Lt.-Col., M.D., I.M.S. (*Director of the Pasteur Institute of India*).

**Nicholas, M. J.**, Assistant Surgeon, I.M.D. (*Assistant to the Director*) and **Lahiri, B. N.**, Sub-Assistant Surgeon, I.M.D. (*Investigation aided by a grant from the Indian Research Fund Association*).

The effect of immersion in ether of brain substance containing different strains of rabies virus has been tested. The results of the experiments show that the resistance of the virus is not the same in every case.

## PHARMACOLOGY.

**191.** A Retrospect of Six Years Research on the Indian Indigenous Drugs. **Chopra, R. N.**, Major, M.A., M.D. (Cantab.), I.M.S. (*Professor of Pharmacology, Department of Pharmacology, School of Tropical Medicine and Hygiene, Calcutta*).

A large number of medicinal plants grow in India and during the last six years a systematic study of these has been undertaken. Firstly the drugs of known value which are recognised by the British and other Pharmacopœiæ are being investigated, in order to see, whether the standard of active principles of those growing in India is equal to those used in the Pharmacopœias. The allied species of these plants which grow in this country are also being examined in order to see if they can be used in therapeutics in place of the official drugs. A number of drugs belonging to this class have been examined. *Artemesia brevifolia* (Wall and *A. maritima* (Linn) grows abundantly in the Northern Himalayas and yield excellent santonin. Good quantity of *Digitalis purpurea* grows in Kashmir and in Mungpoo near Darjeeling. *Psychotria ipecacuanha* can be grown in certain parts of the Himalayas gives good yield of emetine. Valerian, hyoscyamus, belladonna, podophyllum, colocynth, colchicum, juniper and many species of aconite grow in different parts of India are of excellent quality.

Secondly research has been directed towards the investigation of well known remedies that are used in the indigenous systems of medicine in vogue in this country. These remedies are being gradually analysed, their active principles isolated and their pharmacological actions are being worked out. We are also trying them clinically in order to see whether the claims made regarding their efficacy can be proved or disproved. We have worked out a number of such drugs. *Bærrhavia diffusa* (Punarnava) is a good diuretic; *Vitex peduncularis* and *Berberis aristata* are useless in malaria. *Butea-frondosa* (Polas) and *Serrutula anthelmintica* (Somraj) are good anthelmintics; *Psoralea corylifolia* (Bukchi or Babchi) have given good results in the treatment of leucoderma; *Saussurea lappa* (Kuth root) is a very effective antispasmodic and is an excellent remedy for certain types of asthma and persistent hiccough; the alkaloid conessine from *Holarrhena anti-dysenterica* (Kurchi) promises to be of use in amœbic dysentery; *Sida cardifolia* (Barela) possesses a very potent alkaloid whose action resembles ephedrine.

**192.** On the Pharmacological Action of Cinchona Alkaloids on the Heart and Uterus. **Chopra, R. N.**, **David, J. C.** and **Dikshit, B. B.** (*From the Department of Pharmacology, School of Tropical Medicine and Hygiene, Calcutta*).

*On the uterus:*—Much confusion exists in the literature concerning the action of cinchona alkaloids on the uterus. While some workers have obtained increase of tone and automatic movements, others have stated that relaxation is produced under certain conditions. We made a comprehensive experimental study and tested the action of various dilutions of these alkaloids on the isolated uterus of the cat and guinea-pig and on the uterus in situ of the cat. Most of the cinchona derivatives show varying degrees of stimulating effects on the uteri of these animals. The hydrogen-ion-concentration at which maximal results are obtained varies with the uteri of different species; the cat's uterus works best at pH 7.6 while the guinea-pig's uterus acts best at 7.2. This fact is probably responsible for a good deal of discrepancy in the results obtained by various investigators.

The dextro-rotatory alkaloids on the whole have a more powerful effect on the uterus than the levo-rotatory ones. The most powerful alkaloid of all is quinamine, which is dextro-rotatory and which in such high dilutions as 1 in 500,000 produces a well marked contraction of the isolated and intact uterus in pregnant and non-pregnant states. The oxytocic action of quinamine should be borne in mind when prescribing cinchona febrifuge for pregnant women.

Our experiments show that the oxytocic action of quinine is quite pronounced when the uterus is nearly full term but in early cases of pregnancy beyond slightly increasing the amplitude of the automatic movements no outward effect is likely to be produced. We have not been able to prove that quinidine was in any way a better oxytocic than quinine or that it was 10 times as strong as quinine in its stimulating effects on the uterus as claimed by some workers.

*On the heart:*—The cinchona alkaloids, especially quinine and quinidine have been credited by some observers with having a stimulating action on the heart, while others have claimed that they have a depressing and even a damaging effect. We made a comparative study of the action of different alkaloids on the heart of cold and warm blooded animals.

On the amphibian heart, most of the cinchona alkaloids in low concentrations (1 in 100,000) produce a very evanescent stimulation of the ventricles but this effect soon passes off. With somewhat higher concentrations (1 in 50,000) the heart is slowed, the amplitude and the force of the beat are both decreased; still larger doses (1 in 12,500) produce a rapid arrest of the heart in diastole.

On the mammalian heart under experimental conditions the effects are not so constant. Most of the alkaloids often produce a stimulation of both the auricles and the ventricles, not followed by any depression. Cinchonidine produces depression from the very beginning. None of these alkaloids produce any marked slowing of the heart-beat.

**193.** Opium Habit in India. **Chopra, R. N.,** Major, M.A., M.D. (Cantab.), I.M.S. and **Khem Singh Grewal.** (*From the Department of Pharmacology, School of Tropical Medicine and Hygiene, Calcutta*).



Poppy found its way into India many centuries ago as it did into China but addiction to opium has never been so widely prevalent in this country as in China. Statistics have been collected to show that taking of opium is restricted to certain localities and is confined to certain classes of population only. Our investigations in the Punjab go to show that the habit is mostly confined to those places with a high percentage of Sikh population while in other districts the consumption is even lower than the maximum for medical purposes laid down by the League of Nations. The drug is mostly taken in pill form and in some parts (e.g., Rajputana), it is dissolved in water and drunk. Lately the popular method adopted is to mix it with tea, and drink it in form of a decoction. Poppy capsules from which opium has not been extracted, called *Post* or *Kokunar*, are macerated in water and menstrum is drunk by a small section of the population. With the exception of Assam smoking of opium is uncommon among Indians.

The production and distribution of opium is strictly controlled by the Imperial and the Provincial Governments. The area under poppy cultivation is restricted and is being decreased every year. Large amounts of opium, however, is produced in the Feudatory States and hill areas where the Government have no control and some of this finds its way illicitly into British India.

We have made a careful study of 500 opium addicts and are of opinion that the Indian addicts may be roughly classed under two heads:—(1) Those who take small quantities and show no tendency to increase the dose. Cases belonging to this class start the habit later in life, usually after 40 years of age, on account of some ailment, infirmity, stress of life or some such cause. They are usually satisfied with small doses, generally less than 5 or 6 grains a day. In this group no ill effects mental, moral or physical have been noticed; in fact the habitues generally think that the little opium they take does them a lot of good and prolongs their life. (2) The second class of addicts take large doses, over 10 grains a day and often much more. They start with a small dose and go on increasing it till their means allow to go no further. To this class belong young people who take it mostly as a luxury for the euphoric symptoms that are produced or as a substitute for alcohol when the latter is not available. Most of this group started the habit by association with other addicts, some for sexual enjoyment others for no particular reason. The addicts belonging to this group showed signs of mental, moral and physical deterioration. Most of them think that the habit is doing them harm and are anxious to give it up but are not strong enough to do so.

**194.** Ephedrine. Dr. **Read, B. E.** (*Professor and Head of Pharmacology, Union Medical College, Peking*).

**195.** Observations on the Stability of Chloride of Lime, "Stabilised" Chloride of Lime, and Perchlaron in the plains of Bengal. **Tomb, J. W.,** O.B.E., M.A., M.D., D.P.H. (*Medical Officer of Health, Asansol Mines Board of Health*).

*Introduction.*—Tabular details of observations. Conclusions.

## VETERINARY.

**196.** Multiceps Serialis Grigerii in Animals other than Rabbit, Squirrel, etc. **Debakar, De, R. S.**

**197.** Bovine Tuberculosis in India. **Edwards, J. T., D.Sc., M.R.C.V.S.** (*Director, Imperial Institute of Veterinary Research, Muktesar*).

**198.** An Improved Vaccine for Immunization against Rinderpest. **Kelser, R. A., Major** (*Medical Department, Research Board, U. S. Army, Manila, P. I.*).

**199.** Infectious Animal Diseases and their Control in Japan. **Dr. Makamura, N.** (*Japan*).

**200.** On the Strongyloidosis Intestinalis of Formosan Farrow. **Dr. Tosinobu Miyamoto** (*Government Research Institute, Formosa, Japan*).

The so-called "White Diarrhoea" of young pigs, which has been known since early times by the natives, has been increasing more and more recently with the introduction of Berkshire breed. I have frequently found Nematode eggs and larvæ, which seemed to be those of *Strongyloides suis*, Lutz (1885), in the faeces of young pigs, also by sectioning many mother worms in the small intestine. Thinking that almost all obstinate cases of the disease might be from this kind of parasite I offered a suggestion to breeders how to protect their young pigs from it.

**201.** Balantidiosis coli beim jungen Schweine in Formosa. **Dr. Tosinobu Miyamoto** (*Government Research Institute of Formosa, Japan*).

Balantidium coli (Malmsten), wie sagt, ein sehr häufiger Bewohner des Dickdarmes beim Schweine, der keine Störungen der Gesundheit erzeugt, sondern sich lediglich als ein Darmkommensal verhält, die Faeces sind beim Vorhandensein des Infusors in keinerlei Weise verändert. Aber beim jungen Schweine die Verhältniss ganz andere sein, da beobachte heftigen Durchfall. Die Darmentleerungen werden wasserig, schleimig oder blutig verfarbt, oftmals gleichzeitig im Verein mit Strongyloidosis von Dundarm. In diesen complex Formen gewöhnlich gehen die sämtlich Kranken zugrund.

Am schwersten erkrankt Blinddarm und Grimdarm, Rundzellinfiltration, Epithel verlusten, Nekrose, Geschwür und Knotchen im m.m., und unter Umstand ein von der epithel-verlustig gewordene m.m. ausgehende Septikämie.

Es kann nicht ausgeschlossen dass Balantidium coli beim jungen Schweine krankmachende Wirkung habe.

**202.** Gastroenteritis Hæmorrhagica in the Cattle of Formosan Milkens. **Dr. Tosinobu Miyamoto, Tosituna Nomura and Siwiti Ono** (*Government Research Institute, Formosa, Japan*).

1. Outbreak: since the last 10 years an acute gastroenteritis among cows, chiefly of the Holstein hybrid breed has been noticed leading to the loss of about 200 head.

2. Course and Prognosis: 187 cases observed; severe cases take a peracute course and death occurs within 24 hours, the acute cases die within a week, light cases may recover in 5 to 10 days. Mortality is about 43 per cent.

3. Symptoms: 35 cases observed; high, quick and irregular pulse are marked terminating with acute course without exception, fever not marked, respiration quiet. Neither vomiting nor colic, appetite impaired, constipation, diarrhoea watery, mucous or mixed with blood.

4. Anatomical changes: 20 cadavers examined. Chiefly digestive canal and heart are affected. Jejunum, ileum and cæcum are most noticeable, next the colon and stomach. Hæmorrhage of m.m., necrosis, erosion or separation of epithelial layer and also hæmorrhagic infiltration of submucosa. Heart with extensive hæmorrhages, especially the auricles, apex, valves and other parts of epi- and endocardium, but not extending very deeply into the myofibre.

5. Microscopical: Digestive apparatus; blood congestion, hæmorrhage, round cell infiltration into mucous membrane, submucosa and muscle layer, degeneration, necrosis and erosion of epithelial layer. Heart; blood accumulation in the loose connective tissue, or superficially, but sometimes intrafibrillar hæmorrhage of heart muscle recognised by cloudiness and degeneration of myofibre.

6. Causal organism: by intravenous injection and feeding experiments with pure culture of *B. paratyphus*—*B. type* like bacillus isolated from the bloody mucous fæces of two cases, healthy test cattle become sick with symptoms and anatomical changes identical with those seen in natural infection. If the introduced bacilli are small in quantity the experimental infection is light and the animal recovers, with larger quantity the animal develops a severe infection with marked symptoms and a fatal termination.

7. Mode of infection: consideration suggested the food material called "Tofukasu" which consists of ground raw bean. When this material was fully disinfected by hot steam the outbreak was brought to a standstill.

8. Conclusions: We have discussed systematically the hæmorrhagical gastroenteritis of cattle outbreaks of which have occurred during the last ten years among the cattle of milkers causing much loss, we have isolated a special infectious agent which belong to the *B. paratyphosus* group and resembles its *B. type*, but which is not the same, finally we have brought the disease to a standstill by a simple practicable means.

**203. Urocystitis Hæmorrhagica of Native Cattle in Formosa.**  
**Dr. Tosinobu Miyamoto** (*Government Research Institute, Formosa, Japan*).

Since a long time back of the cattle which belong to the Zebu line has been noticed by Formosan farmers, and several homely therapeutic measures are employed by them. Some do not think that it is an illness. While it occurs chiefly in the Sintigu prefecture, amounting

annually to about 100 cases, it is rather rare in other parts of Formosa.

As a result of several years exploring and searching for the red urinating cattle throughout the prefectures and investigating the disease clinically, pathologico-anatomically, ætiologically and also trying infection experiments I recognised that the red urine is not the same disease as the so-called "Stallroth," and wholly different from tick fever or other hæmoglobinuria caused by some protozoan infection, and also that it is not caused by such parasites as bilharzia, filaria and so on.

The disease takes a chronic course, the body temperature normal, general condition and appetite not greatly impaired, so that the animal can undertake light labour except in the case of secondary infection.

By sections it is concluded that the red urine almost absolutely originate from cystitis.

The pathological changes of 40 cases of hæmaturial cysts of which strict macroscopical and microscopical observations were made, are classified according to the degree of their changes excepting 2 cases which were Hæmoglobinuria, tick fever, and another 2 cases which were hæmorrhage caused by Retentis urinæ et ruptura cystis of carabæ.

It is divided to 2 large groups:—

- I. Cystitis without tumour.
- II. Cystitis with tumour.

Of course there is no exact limit between both groups indicating gradual removing, also there are several degrees of changes among both group themselves, for example, incomplete tumefaction, only original condition of tumour, progressive hypertrophical state of epithelial cells, simple tumour or mixed complex form and also interfered with secondary diseases.

#### Subdivision.

First group includes	..	..	12 examples.
(a) Simple hæmorrhagical cystitis	..	6	"
(b) Progressive hypertrophical cystitis	..	4	"
(c) Diphtheritic pseudomembraneous cystitis	..	2	"

Second group includes 24 examples. Ordering from the benignant and simple ones to the malignant and complicated.

A. Papillomatous growth—Complete Papilloma—Carcinomatous growth:

1. Papillomatous hypertrophy	..	1 example.
2. Numerous papilloma-growth and connective tissue hypertrophy	..	1 "
3. Papillomata, one large and several small hanging with cord or stem	..	1 "
4. Papillomata, 2 large and 16 small hanging	..	1 "
5. Gland-cell papilloma	..	1 "
6. Papilloma and carcinomatous growth	..	2 "
7. Papilloma and papillomatous growth of prostata, carcinomatous growth and angioma with thick hypertrophy or short stem	..	1 "

B. From progressive hypertrophic cystitis to carcinomatous growth, and to carcinoma through papillomatous hypertrophy.

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|--|-------|-------------|
| 8. Slight carcinomatous hypertrophy  | ..    | 2 examples. |
| 9. Carcinomatous growth, carcinoma durum, large<br>ulcus formation   | .. .. | 1 ..        |
| 10. Carcinoma and papillomatous hypertrophy  | ..    | 1 ..        |
| 11. Carcinoma, flat progressive form, thickness,<br>1.3 c.m.   | .. .. | 1 ..        |
| 12. Carcinoma durum, 1.5 c.m. thick  | ..    | 1 ..        |
| 13. Carcinoma, 2.0—2.5 c.m. thick  | .. .. | 1 ..        |
| 14. Carcinoma, 2.5 c.m. thick  | .. .. | 1 ..        |
| 15. Carcinoma and large ulcer, 3.0 c.m. thick  | ..    | 1 ..        |
| 16. Carcinoma dullum, papillomatous hypertrophy,<br>wide and hard c.t. fibrous growth including<br>fibroma and sarcoma, 3.0—5.0 c.m. thick | .. .. | 1 ..        |

C. Progressive hypertrophic cystitis goes to benignant, and on to malignant tumour, traceable the malignification of the tumours and reaching up to the complicate growth of 2 or more malignant tumours.

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|---|------------|
| 17. Both carcinomatous and sarcomatous hypertrophy  | 1 example. |
| 18. Small spindle cell sarcoma and polymorphcell-<br>sarcoma, and child-head-large papilloma with<br>several c.m. long dense fibræ  | .. .. 1 .. |
| 19. Superficially carcinoma, deeper part large<br>spindle cell, sarcoma, and ulcer formation  | .. .. 1 .. |
| 20. Polymorph cellular sarcoma, large "Blumenkohl"<br>like growth   | .. .. 1 .. |
| 21. Superficially plastic cells, deeper part, long<br>spindle-cell-sarcoma, large papilloma with<br>dense fimbriæ and polypous growth. Myxomata<br>and angioma are included | .. .. 1 .. |
| 22. Small round cellular sarcoma making gigantic<br>growth and metastating and connecting to<br>neighbouring organs   | .. .. 1 .. |

### Conclusion.

The cause of the cystitis is not yet decided, ætiological agents unknown, but several irritating or co-operating factors and conditions are considered.

Probably the inflammation of m.m. of cyst are caused by some causes which may be one or more, and the inflammation progresses gradually by constant or repeated irritation introducing to the hypertrophy and tumefaction of m.m.

It begins as slight benignant tumours growing gradually, and changing to the malignant state which developes to complicated malignant tumours of high degree.

Observing myself these evolutionary phenomena of the cyst-tumours I think the irritation theory of tumefaction has been proved also by these natural contributions.

**204.** Virulence of Tubercle Bacilli isolated from Cattle in India. **Soparkar, M. B.,** M.D. (*In Charge Bovine Tuberculosis Inquiry, Muktesar*).

Tuberculosis has been generally held to be a rare disease among cattle in India, and the rarity of the disease has been attributed by *Sheather* (1921) to a relatively low degree of virulence in the causal organisms. The results of his experiments at Muktesar led him to conclude that "they appear to indicate beyond all possibility of doubt that the strains of tubercle bacilli infecting cattle in India possess a distinctly lower degree of virulence than tubercle bacilli isolated from cattle in Europe."

In the course of his investigations at Muktesar during the last four years, the author has performed experiments to check this view. In 1924, strains of tubercle bacilli were isolated from lesions, strictly localised to pharyngeal and bronchial glands respectively, in two oxen slaughtered at the Cawnpore municipal abattoir. The two strains were tested by inoculation into small laboratory animals and young calves, along with a strain of high virulence (*GRIFFITH*) recently obtained from Europe. The Indian strains proved to be fully as virulent as the European strain, although individual differences not considered abnormal, were noted between the two local strains.

Subsequently, strains of tubercle bacilli isolated from cattle in various provinces have been investigated, and no appreciable differences in virulence have been noted among them, whether they were derived from localised lesions or the lesions of generalised tuberculosis.

The rarity of gross tuberculous lesions observed hitherto among indigenous cattle and the usual tendency for the lesions to remain localised in affected animals cannot therefore be ascribed to any noteworthy difference in the virulence of the infecting organisms.

**205.** The Treatment of Canine Piroplasmosis. **Stirling, R. F.,** Major, F.R.C.V.S., D.V.S.M., F.Z.S., I.V.S. (*Secand Superintendent, Civil Veterinary Department, Central Provinces; at present Officiating Pathologist, Imperial Institute of Veterinary Research, Muktesar*).

The paper records the author's experience in the treatment of canine piroplasmosis during the past seven years in the Central Provinces and (lately) in the United Provinces. The forms of canine piroplasmosis treated were those induced by *Piroplasma canis* and *P. gibsoni*, both of which are of common occurrence in India.

#### TREATMENT OF PIROPLASMOSIS CAUSED BY *P. CANIS*.

The well-known condition (the so-called malignant jaundice) caused by this parasite has been long known to be amenable in a remarkable manner to treatment with trypan-blue. The following procedure adopted by the writer in the application of the drug was found to yield very satisfactory results.

The drug is made up in 2 per cent. solution in water. The solution is filtered, autoclaved for 20 minutes at a temperature of 120°C., cooled and distributed into sterile bottles, and the material used as required.

The dose for the drug is 5 to 6 c.c. of the solution, to be repeated after an interval of a few days to a week at the most.

For the administration of the drug, use was at first made of the subcutaneous route, but later it was administered intravenously into the external saphena vein. Wallis Hoare ( ) refers to the African experience that when the drug was administered subcutaneously, "there was a great tendency to abscess formation if aseptic precautions were not taken." In the course of our experience it was found that such was the case so long as the injections were made into the inner flat surface of the thigh. The proneness to abscess formation at this site was thought to be associated with the likelihood of the animals conveying infection from their anal and genital region to the seat of injection by repeated licking of one part and then the other, and so various other parts of the body surface were tried for inoculation. It was found that abscess formation became extremely rare when the injections were given either subcutaneously on the side of the neck, or intramuscularly, by deep injection, into the gluteal muscles. In fact, when abscess did occur it was almost invariably traced to lack of necessary precautions on the part of the operator.

#### TREATMENT OF PIROPLASMOSIS CAUSED BY *P. GIBSONI*.

The affection caused by this much smaller "piroplasm" differs clinically from that caused by *P. canis* in that it is usually more prolonged in its effects and the symptoms are generally those of a progressive anæmia with a frequent tendency to relapse at prolonged intervals. It does not respond, it would seem, to treatment with trypan-blue, but good results have been obtained by repeated treatment with certain arsenical preparations, notably, tryparsamide. The procedure recommended by the author in the application of this drug is as follows:—

A solution of normal saline is first subjected to sterilization in the autoclave maintained at 120°C. for 20 minutes. When the solution has cooled, the drug is added to it at the rate of 0.85 gramme per 5 c.c. The whole of the operation is carried out under strict sterile precautions and it is recommended to examine the purity of the preparation in various stages by ordinary laboratory tests.

The dose for a cocker-spaniel weighing about 25 lbs. is 5 c.c. For hounds 10 c.c. is used, whilst for dogs of 10 to 12 lbs. in weight, 2.5 c.c. seems to be sufficient, and for unweaned pups of any breed 0.5 to 1 c.c. gives good results. The best results were obtained by giving five injections at five-day intervals, although in some cases complete sterilization of the blood stream seemed to have been effected after only three injections. In exceptional cases, as many as eight injections were necessary. When an attempt was made to shorten the course by increasing the dose of the drug, it was found that certain untoward symptoms arose, manifested especially in the form of lack of co-ordination.

The drug is given preferably into the external saphena vein, but it is administered with the greatest safety subcutaneously into the side

of the neck. Out of a series of 650 subcutaneous injections, all done by laymen, not one was followed by the occurrence of abscess formation.

The results obtained from the employment of the drug in the manner described above may be declared to be satisfactory. However, in clinical veterinary work in India, it is, for many reasons, difficult to keep accurate record of cases, and the brief report which now follows, relative to an outbreak of *P. gibsoni* infection, attains special significance in that the cases alluded therein were kept under observation from practically the commencement of injection until the termination of treatment.

The dogs affected numbered 126 and were those of kennels belonging to one owner. The varieties comprised spaniels, hounds retrievers, pekinese and poms and some other small breeds. The majority of these animals were imported from England or were the progeny of imported dogs.

For about two years losses amounting to over 25 per cent. of the kennels occurred each year, and the deaths had been attributed to various causes. Examination of blood smears disclosed the presence of *P. gibsoni* in 78 per cent. of the animals, whilst 11 showed a mixed infection with *P. canis* and *P. gibsoni*. All the 126 animals were subjected to a course of treatment with tryparsamide. After three injections, the number of animals showing parasites in the blood stream was reduced to 18 per cent. and after five injections, only four dogs showed small numbers of *P. gibsoni* in the circulating blood. These four were given three more injections and after this their blood was found clear. During the season under review only one death occurred and this was in the case of a spaniel which died a day after receiving the first injection.

**206.** On the Morphology of the Virus of Contagious Peripneumonia of Cattle (Demonstration). **Taniguchi, T., M.D.** (*From the Government Institute for Infectious Diseases of the Tokyo Imperial University*).

The virus of bovine contagious peripneumonia offers us a special interest, because it is the only filter-passing virus which has ever been cultivated with success.

As to the morphology of the virus, opinions differ to a great extent. It used to be very difficult to obtain demonstrable specimens of the virus, as it is so small as to be able to pass through a porcelain filter, and they are not only difficult to be dyed with usual staining methods, but also always mixed and veiled with granules and precipitates coming from both the dyestuff and the constituent of the culture media.

It seems to me that nobody ever succeeded in getting a clear figure of the micro-organism to make a clear-cut distinction between the real virus and the false one. Therefore it is supposed that the divergence of opinion has come out.

After painstaking efforts, Dr. Hazato in my laboratory has devised a staining method which always gives satisfactory results.



The method is as follows:—

- (1) Prepare and fix films in the usual manner.
- (2) Immerse in 5 per cent. aqueous solution of chromic acid for one minute.
- (3) Wash carefully and thoroughly in water.
- (4) Pour Giemsa's solution diluted as usual with distilled water and allow it to act for three hours or more. If the heating and cooling method is used, 20 minutes are sufficient to get the same results as above: Take Giemsa's solution diluted at the rate of 2 drops per 1 c.c. of water.

Heat at 55 to 60°C. for 5 to 10 minutes, cool off ice or on ice-cold water for 5 to 10 minutes.

- (5) Wash in water, dry and mount.

The micro-organisms are stained intensively bichromatic with this method. The organisms are round, oval or coccobacillary in shape and measure ca. 0.2 to 0.4 in diameter, and they are arranged in mono- or diplo coccoid, tetragenous, and sarcina like forms, or the form of short chains, but originally they have no special arrangement. Thus they are mono coccoid. In old cultures, the evolution of the form to the filament, vibrio, spirillar or into S-form, can be observed, but the typical form of the virus should be the monococcoid or coccobacillus. Hence we cannot agree in designating the virus as *microcyces* (Frosch) or *Asterococcus mycoides* (Borrel), the names given to the virus on account of its pleiomorphism, which has been assumed to be the special characteristic of the virus, though it might have been an accidental concomitance of various bodies, which caused the confusion in the observations of previous investigators.

## Abstracts and Titles of Papers Received too Late for Classification.

**13. Diabetes in the East.** **Stott, H.**, Major, M.D., M.R.C.P., I.M.S. (*Medical College, Lucknow*).

*I. Introductory.*—The scope and opportunities of this discussion. Questions for discussion.

Frequency and importance of diabetes in India.

The readiness with which the large majority of cases can be diagnosed, prevented and treated.

*II. What is Diabetes Mellitus?*—Should cases described as Alimentary Glycosuria be regarded as cases of diabetes mellitus, or should the chronic glycosuria of an obese individual originating from an excessive carbohydrate dietary and from lack of physical exercise be regarded as distinct from the thin acute case of children and of young adults?

There are these two main types of disease, between which there are marked contrasts. Personal opinion is that from the fundamental pathological standpoint of hyperglycæmia these two types cannot be separated though the cause, progress, clinical condition and treatment of the hyperglycæmia is in marked contrast. The first type I would term the dietetic type of diabetes, and the latter the primary pancreatic type.

*III. Consideration of dietetic type of diabetes.*—Prolonged clinical experience of Indian diabetic from special beds devoted to their study indicates that the first type can be best grouped into the following clinical stages:—

1. Prediabetic Stage (undeveloped diabetes).
2. Stage of slight and intermittent glycosuria (mild diabetes).
3. Stage of profuse and constant glycosuria (Medium diabetes).
4. Stage of complications (complicated diabetes).

The products of depraved metabolism cause a progressive arterial degeneration resulting in arterial sclerosis, with death in uræmic coma, heart failure, gangrene or cerebral hæmorrhage if an intercurrent infection does not previously determine a fatal issue.

*IV. Consideration of the primary pancreatic type of diabetes.*—Though compared with the frequency of dietetic diabetes, pancreatic diabetes is comparatively rare yet it is commoner in India than is commonly supposed. Stages of rapid wasting and of ketosis usually terminating in diabetic coma.

*V. Diagnosis.*—*The Urine and Blood Sugar.*—Provided precautions re. fallacies be taken, anomalous reduction reactions when the

urine is tested usually mean the presence of a slightly increased amount of urinary sugar above the physiological amounts normally present. Confirmation by Blood Sugar tolerance curve. Investigations from the pathological laboratory of King George's Medical College. The fasting level of the Blood Sugar in Indians. Variations of this level due to (1) meals, (2) personal factors such as diet, overfeeding, obesity, physical occupation, and social status, (3) age.

*VI. Renal Glycosuria.*—Is it not uncommon or rare in India? Does an early stage of diabetes exist with a lowered renal threshold?

*VII. The cause of dietetic and of primary pancreatic diabetes.*—The regulation of the carbohydrate mechanism by the interrelation of the endocrine glands. Blood sugar records from cases of Hypothyroidism, Hypoadrenalism and hypopituitarism.

*VIII. The modern scientific treatment of diabetes.*—Its success when properly carried out. The inefficiency, with which it is generally applied. The hold of quackery and of proprietary medicines on the people. The vast value of insulin in complicated and in acute cases, when properly used, the frequency with which insulin is abused. Its contra-indication in mild and early cases of medium severity.

#### *IX. Conclusion.*

**21.** Glaucoma as seen at the Calcutta Eye Infirmary, 1926-1927. **Coppinger, W. V.,** Lt.-Col., D.S.O., I.M.S. (*Superintendent, Eye Hospital, Calcutta.*)

1. Cases, numbers and types to the following classification:

(a) Simple, due apparently to abnormalities of the eye either congenital or due to age.

(b) Inflammatory, in which there is definite evidence of antecedent or concurrent inflammatory disease in the eyes.

(c) Epidemic Dropsy, not showing signs of inflammatory troubles but associated with this disease.

(d) Cataract Glaucoma.

(e) Those due to other causes.

2. Conditions affecting the Glaucomatous state, age, sex, Wassermann Reaction, blood pressure, urine abnormalities.

3. Treatment adopted, non-operative and operative.

Remarks on lessons shown, by these cases:

(a) Glaucoma not merely due to an obstruction in the drainage from the eye, but also associated with a condition of loss of pressure equilibrium in the eye.

(b) Some cases of failure in Glaucoma operations.

(c) The tendency to recurrence in cases associated with Epidemic Dropsy.

**23.** Glaucoma, as a complication of Epidemic Dropsy. **Mukerjee, S. K.,** L.M.S., F.R.C.S. (*Calcutta*).

#### *History.*

Periodical outbreak of epidemic—4th epidemic from August 1926. Previous records in the literature—observations based on 253

cases—206 treated at the Carmichael Medical College and 47 private patients—many patients in one family (in some as a first sign of the general disease).

### *Statistics.*

Common in Hindus—a rice-eating nation—record of the different ages, of the patients, their sexes, habitation and their mode of living.

### *Onset.*

1. *Prodromata*.—Transient obscuration of vision with rainbow haloes (some cases did not progress beyond this stage).

2. *Progressive stage*—*Subjective symptoms*.—Pain, lachrymation, occasional nausea, vomiting, haloes, misty vision and diminution of visual acuity.

#### *Objective symptoms—*

- (a) Conjunctiva and sclera.
- (b) Cornea—difference of ordinary types of glaucoma.
- (c) Ant. chamber—its measurement, its difference with acute or chronic glaucoma.
- (d) Iris—changes in the pupil—not constant—changes in colour.
- (e) Ciliary body—weakness of accommodation.
- (f) Lens—not much change found.
- (g) Optic nerve—changes in its colour, cupping of the disc (not always complete, sometimes progressing—differentiation from ordinary types of Glaucoma),—changes in the vessels and abnormal pulsations.
- (h) Retina—not marked changes (Retinitis found in 2 or 3 cases).

### *Field of Vision.*

Constant early change in almost every case—Siedel's sign, Bjerrum's sign—Contraction of nasal field—Concentric Contraction,—tube vision.

### *Tension.*

• Tonometry with McLean's tonometer—variation of tension—always above the normal limit.

### *Ætiology.*

Examination of blood, urine, blood pressure, non-protein, nitrogen, etc.—probable theory.

### *Treatment.*

#### *General:—*

- (a) Hygienic.
- (b) Medicinal and
- (c) Dietetic.

#### *Local:—*

- (a) Medicinal—myotics, good effect in many cases.
- (b) Operative—under certain conditions—iridectomy or trephining (latter in many cases) results—complications (immediate and remote).

**32. The rôle of Indian Hemp in Causation of Insanity in India.**  
**Dhunjibhoy, J. E.,** M.B., B.S., Capt., I.M.S. (*Kanke, Ranchi*).

There is a special form of mental disease commonly met with in India which is usually produced by excessive or even prolonged moderate use of hemp drugs in any form. This form of insanity has a train of symptoms of a fairly uniform character and in a large majority of those afflicted no psychopathic or neuropathic history could be elicited.

*Sex.*—It is generally confined to male sex, as a large number of addicts to this drug are males, but some women, specially those who are disciples of Gurus and Sadhus and devotees of God Shiva, also indulge in this habit. In my experience I have seen two cases of female patients suffering from Hemp Insanity, and similar cases have been reported by my contemporaries in charge of different Mental Hospitals in India.

*Age.*—Generally, between the ages of 25 and 40 persons are affected, but I have treated also a boy of 15 and an old man of 65 suffering from Hemp Insanity.

*Hemp Plants.*—Hemp plants grow wild in all the provinces in India, but for excise purposes it is specially cultivated in some provinces, for example, Ganja in Bengal and Charas in Yarkund. Hemp plant is used in the following three chief forms in India:

(1) *Ganja.*—It consists of the plant itself, stem, leaves and flowers matted together in long bundles. It is chiefly used for smoking but it is also eaten by some in pan or mixed with charas in pill form.

(2) *Bhang or Sidhi.*—It is a mixture of leaves and capsules without stems. Bhang is made into a decoction and drunk. It also forms a chief basis of sweetmeats called Majum.

(3) *Charas.*—It is a resinous extract from the leaves and flowers. It is either smoked or swallowed in pill form.

All the above forms of hemp are generally mixed with potent drugs like opium, dhatura, arsenic, nux vomica and aconite by those, on whom the simple form of hemp drug has ceased to produce the desired effect of exhilaration or stupefaction. Hemp drugs are cerebral stimulants and they also produce mental disorders.

*Symptoms of Hemp Drug Insanity.*—Symptoms resembling those of Acute and Chronic Mania are common and found in Hemp Drug Insanity with typical history of drug habit, a peculiar eye condition, very seldom complete loss of speech and generally with or without psychopathic or neuropathic heredity.

*A Peculiar Eye Condition.*—This I consider almost pathognomonic of Hemp Drug Insanity whether the drug be a predisposing or exciting factor. In all such cases a marked conjunctival congestion is seen in the horizontal vessels of both eyes. Recent cases show acute congestion of these vessels and in chronic cases the acute congestion is replaced by a well-marked line of blood pigment in the vessels, even in cases of many years standing.

*Complete Loss of Speech.*—Complete loss of speech was seen by me in one case of Hemp Insanity. The patient did not speak for 8 years although he understood every word of what was said to him.

Another case was reported by the police where the patient did not speak at home for over 2 years.

In acute cases patients have a tendency to impulsive acts of violence and destruction and a total loss of memory for the same. Running amuck and unpremeditated murders have been committed by Hemp Drug addicts and on complete recovery (which is a rule in such cases) the patients have no memory of the crimes and invariably plead not guilty.

*Pathology.*—I had an opportunity at Berhampore Mental Hospital (Bengal) to perform post-mortem in two cases of Hemp Drug Insanity and I did not notice any abnormality except slight chronic congestion of some internal organs.

*Treatment.*—Absolute stoppage of all hemp drugs, rest, regular diet and exercise. Hydrotherapy is also very useful in acute cases.

*Connection of Hemp Drugs with Crime.*—Habitual use of hemp drugs degrades the mind and character of the consumer and predisposes him to crime in general. Thus the hemp is one of the most efficient means for increasing the criminal classes. It is also largely consumed by bad characters and badmashes to fortify themselves for crimes. Bhang is a very useful weapon in the hands of criminals for looting ornaments from prostitutes and children. Similarly, Ganja generally mixed with Dhatura and other potent drugs is a very useful weapon in the hands of criminal gangs to make an innocent man to commit murder of another in order to suit their purpose. Unpremeditated crimes, especially murders or running amuck, are not uncommon occurrences with sudden large doses of hemp drugs.

*Conclusion.*—The Indian Mental Hospital at Ranchi has a male population of 1,200 and the history of indulgence in hemp drug could easily be traced to 30 to 40 per cent. of this population. On analysis of 1,200 cases it was found that in cases of 138 patients history of indulgence in hemp drugs was strongly corroborated by (1) Descriptive Roll which is usually filled up by police after due enquiry from the relatives and friends of the patients.

(2) Patients' own statements, and

(3) Peculiar eye condition mentioned above.

In other cases one or two of the above factors were absent.

In conclusion I am strongly of opinion that insanity is the inevitable result of the use of hemp drugs whether in excess or in moderation for a prolonged period and that it is induced earlier in cases of neuropaths and psychopaths. I am also of opinion that the hemp drug is a direct cerebral poison and I put this drug without the slightest hesitation above alcohol, opium and cocaine in their injurious tendencies such as causation of insanity in India.

**39. Some Observations on Pan-supari Chewing**—Use of Baval-stick as a Tooth-brush—and Use of Tooth-pastes as a Dentifrice. **Modi, J.J., L.M. & S., L.D.S (Eng.),** (*Professor of Dentistry, Grant Medical College, Bombay*).

From the title of the paper it will be seen that it contains a queer collection of subjects, some (Pan-supari and Baval-stick) with the

history of usage so very long that it almost recedes into the hoary past; and the other (Tooth-pastes) with no history at all for they are a product of very recent origin.

### *Pan-supari Chewing.*

This habit of Pan-supari chewing to my mind has its origin in the prescriptions of the ancient Hindu doctors. Pan, i.e., Betel-leaf-Pepper (Piper-Betel) has been prescribed from ancient times by Hindu doctors as a stimulant—aromatic—carminative—astringent and an aphrodisiac. So also Supari, i.e., Areca or Betel-nut (Areca-Catechu) has been used as a stimulant—astringent—and a vermifuge. It is also prescribed to increase the flow of saliva—to harden the gums—and to sweeten the breath. These drugs are so efficacious that they were frequently prescribed, almost to the exclusion of other drugs. This frequency so inspired the faith of people in them that they began to use them also as preventives. Then people gradually began to use them before and after their meals, and also offered them to their guests. The frequency, with which they were used and offered to others, as carminatives and digestives, became so excessive that it almost became a habit with them. It also has its aphrodisiac property, and in this property also lies the origin of the custom, which is now only an act of courtesy, of the offering of Pan-supari by the wife to her husband when he comes to her bed, and by the prostitutes to their visitors when they visit them. Thus it will be seen that the use of a good thing like Pan in medical prescriptions, has now degenerated into a popular habit. The effects of this habit of Pan-supari chewing on teeth and mouth are very disastrous. If I may summarize them in short I may say that the teeth are worn down from the top, and as the result of the recession and destruction of gum and bone, they get loose and fall out. Though they suffer from this condition that is akin to Pyorrhœa Alveolaris, they are remarkably free from Caries.

### *Use of Baval-stick as a Tooth-brush.*

Baval (Acacia Arabica) is almost universally used by all Indians as a tooth-brush. It is an inheritance that they have received from ancient times. It also has its origin in the medical science for it is prescribed as a tooth-brush in Ayurveda, but is not meant to be indiscriminately used at all times and for all conditions and persons; for there are twigs of various other trees recommended for various conditions; and in certain conditions the use of any of these twigs as a tooth-brush is actually prohibited. Like Pan-supari, Baval-stick was a fine remedial agent, and its use has now degenerated into a popular habit; for a great bulk (95 per cent.) of people use it whether or not they need it. Three great points in its favour are:—

- (1) The cleanliness—for it can be discarded after each use.
- (2) Its cheapness, in spite of such frequent changes.
- (3) That in order to make a brush of it, one end of it is to be chewed for about 10—15 minutes, and this chewing so scrubs the teeth clean that they remain practically free from Caries.

They have their bad points also and they are:—

(1) Chewing (Occlusal) surfaces of the teeth are worn down and become sensitive.

(2) Because of the constant contact with the astringent juice, the gums recede away, thus exposing the bone underneath it. Bone in its turn gets destroyed giving rise to Pyorrhœa and loosening of the teeth.

As the Hindus generally use both Pan-supari and Baval-stick, and as their mouths are generally affected by Pyorrhœa Alveolaris, the question that arises is "What is (Pan-supari or Baval-stick) responsible for Pyorrhœa?" In my opinion both of them are responsible for this condition; but Pan-supari is more so than the Baval-stick. The habit of Pan-supari and Baval-stick is so ingrained in the people that it is futile to ask them to give them up. Then what is the remedy? To minimise the bad effects Pan-supari eaters may be advised to control it as much as they can, and then to clean the teeth and gums with a tooth-brush and plenty of water after every use and particularly at night before going to bed. Baval-stick users may be advised to fray the end of it outside the mouth in order to take away the astringent juice and then use the frayed end as a tooth-brush.

#### *Use of Tooth-paste as a Dentifrice.*

Pan-supari and Baval-stick, as shown above have their vices and virtues, but tooth-pastes to my mind, have no virtue at all. Of all the three, they are the most harmful, for while the other two are used by Indians only, the pastes are used by all nationalities all over the world. To my mind these tooth-pastes are a bane of human mouths. If the real meaning of the use of anything with the tooth-brush is realised, it will be seen that the tooth-paste has no justification for its existence. Now what is the meaning of using the tooth-powder with the tooth-brush? It is to add to the scrubbing action of the brush. If that is true, and true it is, then there is no justification for the use of a tooth-paste, for by the virtue of its main ingredient (base) it in fact lessens that action. These pastes generally have Vaseline, Lanoline, Oil, Glycerine, and Soap as the base; and as is well known they all are lubricants and not detergents, as powders naturally are. Besides this, they are fermentable substances and should not be brought in contact with the teeth. They stick to the teeth as is evident from the slimy appearance of the teeth under their use, and also help the fermentable food-stuffs to stick on the top of them. Under their long use the enamel of the teeth at the gum-margins, and the gums themselves get soft. Gums get swollen and spongy, and ultimately exude blood and pus. These conclusions are very condemning but they have been arrived at after exhaustive observations. Then it may be asked "What made them so popular with the people?" My answer is

(1) The credulity of the people in the glittering but lying advertisements.



(2) The last World War. Because the tubes could be easily carried about in the haversack, they were recommended in preference to the powder bottles.

I am unshakeably convinced that they are a bane of human mouths, and that conviction did not need any outside support, but when it came, unsolicited, in the form of an article called "Dam (n) the Mouth-washes and Pastes" in Oral Topics of April 1920 by Dr. Zarbough from Italy, I certainly welcomed it. Therein he says that "Tooth-pastes are a snare and a delusion" and indeed that they are.

#### 40. Oral Sepsis. **Taylor, H. A.,** L.D.S. (*Calcutta*).

Oral Sepsis has become such a prominent factor in disease that it might be well to consider some of its aspects and its effects on the system generally. It is commonly agreed that it is one of the main causes of much chronic disease leading eventually to permanent disablement and often premature death.

The term is a wide one covering as it does all septic conditions to be found in the mouth but those which are most commonly considered to be the most common cause of trouble are Pyorrhœa Alveolaris which to my mind is a bad term and is better described as a Chronic Rarifying Periodontitis: the so-called Apical Abscess or Granuloma: Necrosed and Carious teeth: buried roots and impacted teeth particularly 3rd Lower Molars, popularly called Wisdom Teeth. Of these Pyorrhœa and Carious Teeth may be styled Open infections and the others Closed infections and of the two I think that the latter are the more dangerous.

The diseases, which are commonly associated with Oral Sepsis, may be classed as follows:—

1. Inflammation of Mouth and Pharynx.
2. Diseases of the Alimentary Tract.
3. Diseases due to the absorption of septic products from the mouth, e.g., Toxins and Organisms.
4. Diseases which are influenced by the presence of Oral Sepsis.

1. *Inflammation of Mouth and Pharynx.*—Under this heading might be placed—

- I. Chronic Tonsillitis.
- II. Adenitis.
- III. Cellulitis.
- IV. Necrosis of the Jaw.
- V. Suppuration of the Antrum.
- VI. Cancer of the Tongue and Lips.

2. *Diseases of the Alimentary Tract.*

- I. Chronic Indigestion.
- II. Gastritis and Colitis.
- III. Gastric Ulcer.
- IV. Inflammation spreading to the Bile Ducts and Gall Bladder.

These conditions are due to the constant swallowing of septic materials and the result of the chronic irritation set up.

### 3. *Diseases due to the absorption of Septic Products from the mouth.*

I. *Chronic Rheumatism*.—In many cases this disease has been traced to the presence of toxins absorbed from bacteria in the mouth.

II. *Rheumatoid Arthritis*.—Although it is extremely doubtful if this condition is due to the absorption of toxins from the mouth, I had a case about 6 months ago in which the patient, a male, aged about 46, received definite relief from Arthritic pains in the shoulder joints by the extraction of a crowned incisor root which showed a definite Apical Abscess in a Skiagram.

III. *Chronic Sciatica*.—Here again I quote this condition as the result of personal experience. In 1923 a patient, male, aged about 40, was sent to me by Lt.-Col. Acton, I.M.S., of the School of Tropical Medicine, Calcutta, for oral examination. He was suffering from a very acute form of Sciatica and his medical history showed that while on Military Service in 1914—1918 he had had to be allowed 3 months' sick leave on account of Sciatica. His condition improved but there was recurrence in 1923 which was more acute than the first attack. Col. Acton had examined him thoroughly and decided that organically he was quite sound and thought that the source of infection might be in the mouth. When the patient came to me he was so crippled that when washing out his mouth he was unable to use the fountain spittoon at the side of my chair and had to be given a hand spittoon in which to expectorate. On examination the mouth proved to be healthy and the teeth in good condition, except for a gold crown on the 2nd Upper Right Premolar tooth. It was slightly loose and the gum round it was inflamed. A skiagram was taken by Major Shorten, I.M.S., and showed a considerable amount of Apical absorption. We decided to extract the root and this was done quite easily under a local Anæsthetic. Col. Acton sent along a sterile test tube into which I placed the root and he had a culture made from the bacteria found round the apex and from which he gave the patient several injections. Six weeks later I received a letter from the patient saying that he was entirely cured. I do not think that any further comment on this case is necessary.

IV. *Retro-Bulbar Neuritis*.—About 12 months ago a patient was sent to me by Major Shorten, I.M.S., who asked me to treat the case as urgent as she had lost the sight of her left eye. She had consulted Col. Coppinger, I.M.S., about it and as he is very enthusiastic about the teeth as a virulent cause of eye troubles, he sent her to Major Shorten to have Skiagrams taken of the teeth. These showed the following conditions:—

Left Upper Lateral Incision crowned and showing definite apical infection. Left Upper Canine also crowned and the anterior abutment of a bridge extending to the 2nd Left Upper Molar. This root and the Molar root also showed definite apical infection as did also the root of the 3rd Upper Molar. The 2nd Right Upper Premolar was also crowned and the root was infected as also was the root of the 2nd Left Molar tooth which had been devitalised.

None of these teeth was actually troubling the patient, but I decided that they must come out and after a considerable amount of persuasion on the part of her husband and myself she decided, to have it done. I removed the bridge then and there and next morning the patient came in and I extracted the roots under  $N_2O$  and E. C. In 48 hours the patient's sight was practically normal. Here again I consider that comment is needless, the result speaks for itself.

V. *Pernicious Anæmia*.—Well known authorities in Medicine particularly William Hunter, have shown the close relationship between this disease and Oral Sepsis. He considers the disease to be localised to the Alimentary Tract and that it is definitely due to an infection of certain parts of the gastric mucosa. The disease is frequently associated with septic conditions of the mouth and many Medical men consider that Oral Sepsis is a definite factor in the disease.

VI. *Debility*.—This is a condition with which we are all familiar. No definite organic lesion can be found but the patient is undoubtedly ill. He is listless and thin; sallow of complexion, generally unhealthy looking and has no appetite, in fact shows all the symptoms of Malnutrition. On examination many of these cases have shown definite signs of Oral Sepsis and the condition has been found to be due to the constant absorption of toxins from bacteria in the mouth and in many cases general extraction of the teeth has proved entirely efficacious.

VII. *Ulcerative or Malignant Endocarditis*.—This is due to a Streptococcal infection which attacks the valves of the heart and which generally proves fatal. It has often been found to be due to the absorption of septic toxins from the mouth.

VIII. *Insanity*.—Under this heading we have the famous cases cited at the last Meeting of the British Medical Association where patients were definitely cured by the extraction of septic roots.

#### 4. *Diseases which are influenced by the presence of Oral Sepsis.*

I. *Cancer*.—While this disease can be directly attributed in the cases of Cancer of the lips and tongue to broken down and badly carious teeth which have sharp and jagged edges causing chronic inflammation and irritation by the constant rubbing of the lips and tongue against them, there is no doubt that many cases of cancer of the Alimentary Tract are the result of the chronic irritation set up by the continued absorption of septic matter from the mouth.

II. *Tuberculosis*.—Oral Sepsis must be considered as a pretubercular state in children where the lymph glands are infected by the absorption of septic matter from the mouth and their powers of resistance to the tubercle bacillus lowered. In adults, where the bacillus has already got a hold, their powers of resistance are very much lessened if the system generally is debilitated by the continued absorption of septic matter from the mouth.

And now we come to the question of the means which we are going to take to stop this widespread and dangerous condition. You may have come to the conclusion that I am a confirmed believer in

the practice of wholesale extraction of the teeth as a cure for the condition and so I am when I have proved to my satisfaction that the teeth are so hopelessly infected that no other course is open to me but I do deplore the hankering of the Medical profession generally after this treatment as a cure for all bodily ills—a state of affairs which I am sorry to say became very general in 1920-21 in Britain. Patients with obscure symptoms went to highly distinguished Medical men and were told that their only possible hope of a cure was to have all their teeth extracted and I am only too sorry to say that many members of the dental profession were ready to fall in with the Medical opinion and carry out the nefarious work. What was the result? There are quite a number of people in the world to-day trying to masticate their food with indifferently fitting artificial dentures who would have been much happier and probably much fitter had they hung on to their own natural teeth. Just a word of warning about “Pyorrhœa,” don’t, because you see evidences of pus round a patient’s gum, fly to the conclusion that they have got “Pyorrhœa.” I have had many cases sent to me by Medical men diagnosed as Pyorrhœa in which a careful removal of sub-gingival tartar has resulted in the mouth being made absolutely healthy, and in some cases the stoppage of a prolonged course of Bismuth has had the same result. Please leave the final decision, aided by a thorough clinical and radiographical examination, to the dental surgeon. As regards the Apical abscess, or closed infection we are on entirely different ground and I am beginning to wonder if the devitalisation of teeth is really worth while. The radiograph has shown us that the great majority of devitalised teeth ultimately develop apical infection, no matter how careful and aseptic our technique. I really cannot see how we are going to guard against this infection in a part of the root to which we have no access unless we perform the purely surgical operation of apicoectomy in each case and would it be worth while, I doubt it.

In my opinion there is only one way of stopping Oral Sepsis and that is by education and prevention. The public must be educated up to the fact that children should be taken to the dentist at the earliest opportunity for examination and their teeth watched and attended to carefully and regularly through life. They must be taught to use their teeth as nature meant us to use them. Teeth were meant for mastication and at present are not being used as they were meant to be used. A tooth and its surrounding tissues are like a muscle. If not used properly they become soft and flabby and a prey to all sorts of infection and as you all know the mouth is a hot-bed of such infection. When the child is young educate it up to chew, and give it a diet that requires chewing, also teach it the importance of oral hygiene. Indians, as a race, suffer largely from “Pyorrhœa” and I am certain that it is largely due to their soft diet.

If you can do anything towards educating your patients in this way you will go a long way towards the wiping out of Oral Sepsis.

**42. De-ratting of Ships. Dr. Crow (Port Health Officer, Rangoon).**

"English Quarantine legislation is less restrictive than that of any other country, and it has been criticised as being due partly to the pressure of powerful commercial interests in the country and partly to a national tendency to a policy of "laissez faire." Both of these criticisms can be refuted, for we do all that is necessary and practicable in the present state of knowledge to protect the public health of our own country from the importation of dangerous epidemic diseases."

It is not suggested that every country should adopt our procedure and no more, but it is strongly urged that quarantine restrictions should be exactly in proportion to the dangers that exist, in fact and not in theory. Quarantine legislation should also be protective and not aggressive.

Another problem is the fumigation of ships for rat destruction, which is a health measure of first importance. There is no doubt that many fumigations practised in various parts of the world can only be described as a farce. There are many points in favour of the periodical fumigation of ships at regular intervals of six months which is demanded by some countries, but it is a grape-shot method of attack, lacking the precision that modern scientific method aims to achieve. In the United Kingdom, vessels are fumigated if there is the slightest suspicion of rodent plague on board; for the rest fumigation is ordered when there is evidence that the rats on board are numerous. In Liverpool the necessity for fumigation is based upon the report of the rat-catchers and rat-searchers who are specially trained to examine ships and to report on the degree of rat infestation. This combined with efforts to prevent the passage of rats from the ship to the shore, and the elimination of rat harbourage on the quays, gives very satisfactory results. Its success depends upon a skilled and trained staff which is trustworthy, and it is at least a more rational procedure than placing complete confidence in routine fumigation of all ships every six months, and of every ship from a plague-infected port, regardless of any other consideration.

The above is abstracted from an article written by Dr. E. W. Hope of Liverpool on "Some considerations in regard to the International Aspect of Quarantine Regulation."

The vessels in bold type were trapped with 20 rat traps for one night, the traps were distributed, 10 in store room, 5 in the galleys and 5 in the crew's quarters, the catches are given alongside with the cost in rupees for each rat destroyed by fumigation.

The results obtained more than bear out Dr. Hope's opinion that grape-shot methods of fumigation are expensive and lack precision.

The cost of these fumigations are borne by shipping companies to comply with rules in force in different countries. If the number of rats destroyed is taken as a criterion of rat infestation, then fumigation, its cost, and the delay to the ship is not justified, particularly as trapping failed to elicit any undue rat population in some of the vessels. Rat trapping and rat searching can always be relied on to

give an index of the numbers of rats on any vessel. It is not intended to imply that trapping and rat searching for one night is sufficient, but the figures give some indications. Ships apply one day and must be fumigated the next, it has to be got through and the sooner the better, hence only one night catches are available. Commanders of some vessels have told me that by making as far as possible the store room, the galley and crew's quarters rat-proof a considerable difference is noticeable in the numbers of rats on a ship. Each of these places are made separate by filling in all openings with gauze wire mesh, and taking particular care that all doors and other openings close tight and are well fitting. By making each compartment separate, the movement of the rat is very much restricted, he finds difficulty in getting food and water, and a place to nest.

It might be necessary to add that rat-proofing interferes with ventilation and is considered a hardship by crews in the tropics.

*Statement showing the number of vessels fumigated at the Port of Rangoon, cost realised, and rats killed on each vessel during the years 1924, 1925, 1926 and 1927.*

1924.

Date.	Name of vessel.	Cost of fumigation.	20 traps. Number of rats trapped in one night before fumigation.	Number of rats killed by fumigation.	Cost per rat killed by fumigation.
		Rs.			Rs. As. P.
16-1-1924 ..	S. S. <i>Lady Blake</i> .	175	Not trapped	17	
16-2-1924 ..	" <i>Hughli</i>	275	"	5	10 4 8
21-2-1924 ..	" <i>Warla</i>	220	"	21	55 0 0
11-3-1924 ..	" <i>Kalomo</i>	320	"	3	10 7 7
8-4-1924 ..	" <i>Mandra</i>	390	"	5	106 10 8
12-6-1924 ..	" <i>Nalgora</i>	450	"	8	78 0 0
10-7-1924 ..	" <i>Betwa</i>	179	Nil	2	56 4 0
31-7-1924 ..	" <i>Ben Mohr</i>	330	Not trapped	9	89 8 0
25-8-1924 ..	" <i>Ganges</i>	275	Nil	2	36 10 8
2-9-1924 ..	" <i>Yorkshire</i>	175	Not trapped	Nil	137 8 0
3-9-1924 ..	" <i>Arankola</i>	220	7	450	175. No rat.
12-9-1924 ..	" <i>Malman</i>	330	Not trapped	9	0 7 9
7-10-1924 ..	" <i>Matipara</i>	450	"	7	36 10 8
10-11-1924 ..	" <i>Hamburg Maru</i> .	140	Not trapped	5	64 4 7
12-11-1924 ..	" <i>Hatarana</i>	390	"	3	28 0 0
11-12-1924 ..	" <i>Nalgora</i>	510	"	17	130 0 0
24-12-1924 ..	" <i>Sang Bee</i>	330	"	57	30 0 0
		5,195		620	5 15 5

@ Rs. 8-5-1 per rat.

1925.

Date.	Name of vessel.	Cost of fumigation.	20 traps. Number of rats trapped in one night before fumigation.	Number of rats killed by fumigation.	Cost per rat killed by fumigation.
		Rs.			Rs. As. P.
6-1-1925 ..	S. S. <b>Indo Maru</b>	140	Nil	2	70 0 0
11-2-1925 ..	" <b>Megna</b>	330	1	7	47 2 3
19-2-1925 ..	" <b>Sally Maorak</b>	275	2	11	25 0 0
23-2-1925 ..	" <b>Ganges</b>	275	Not trapped	2	137 8 0
6-3-1925 ..	" <b>Haque Maru</b>	275	Nil	5	55 0 0
15-3-1925 ..	" <b>Tapti</b>	390	Nil	2	195 0 0
19-3-1925 ..	" <b>Yorkshire</b>	175	Not trapped	2	87 8 0
20-3-1925 ..	" <b>Khosru</b>	275	Nil	3	91 10 8
5-4-1925 ..	" <b>Indo Maru</b>	220	Not trapped	2	110 0 0
13-5-1925 ..	" <b>Betwa</b>	275	"	5	55 0 0
11-5-1925 ..	" <b>Lady Blake</b>	140	"	14	10 0 0
29-7-1925 ..	" <b>Silljan</b>	330	1	8	41 4 0
19-8-1925 ..	" <b>Cocoonada</b>	275	3	56	4 1 6
7-9-1925 ..	" <b>Seattle Maru</b>	140	Not trapped	5	24 0 0
7-10-1925 ..	" <b>Sanuki Maru</b>	175	2	5	35 0 0
20-12-1925 ..	" <b>Betwa</b>	275	Not trapped	2	137 8 0
		3,965		131	

@ Rs. 30-4-3 per rat.

1926.

		Rs.			Rs. As. P.
6-1-1926 ..	S. S. <b>Sanuki Maru</b>	220	Not trapped	5	44 0 0
2-2-1926 ..	" <b>Cape Cross</b>	330	1	7	47 2 1
10-3-1926 ..	" <b>Cargo Boats Nos. 890 &amp; 901.</b>	280	Not trapped	26	14 0 0
17-3-1926 ..	" <b>Rubens</b>	330	Nil	Nil	330. No rats.
21-3-1926 ..	" <b>Wooline Marsk.</b>	390	1	Nil	390. No rats.
11-5-1926 ..	" <b>Ganges</b>	275	Not trapped	Nil	275. No rats.
12-6-1926 ..	" <b>Arankola</b>	220	3	144	1 8 5.
13-6-1926 ..	" <b>Megna</b>	390	Not trapped	2	195 0 0
16-6-1926 ..	" <b>Ethiopia</b>	220	"	44	5 0 0
19-6-1926 ..	" <b>Avonda</b>	220	"	66	3 5 4
23-6-1926 ..	" <b>Edavana</b>	275	4	156	1 12 2
24-6-1926 ..	" <b>Chilka</b>	220	Not trapped	25	8 12 9
30-6-1926 ..	" <b>Ekma</b>	275	"	66	4 2 8
14-7-1926 ..	" <b>Crosby Hall</b>	275	Nil	Nil	275. No rats.
5-8-1926 ..	" <b>Yorkshire</b>	390	2	7	55 11 5
24-9-1926 ..	" <b>Sir Harvey Adamson.</b>	140	Not trapped	4	35 0 0
8-10-1926 ..	" <b>Baron Ruthven.</b>	275	Nil	Nil	275. No rats.
22-10-1926 ..	" <b>Sunland.</b>	330	Nil	5	66 6 0
12-11-1926 ..	" <b>Yorkshire</b>	175	Not trapped	2	87 8 0
14-11-1926 ..	" <b>Garmula</b>	330	"	4	82 8 0
		5,560		557	

@ Rs. 9-15-9 per rat.

1927.

Date.	Name of vessel.	Cost of fumigation.	20 traps. Number of rats trapped in one night before fumigation.	Number of rats killed by fumigation.	Cost per rat killed by fumigation.
		Rs.			Rs. As. P.
8-1-1927 ..	S. S. <b>Sanuki Maru</b>	175	Nil	2	87 8 0
29-1-1927 ..	" <b>Baron Belhaven.</b>	390	1	5	78 0 0
17-3-1927 ..	" <b>Chenab</b>	275	Not trapped	7	39 4 6
25-3-1927 ..	" <b>Mattappo</b>	330	Nil	2	165 0 0
27-3-1927 ..	" <b>Ilona Seimers</b>	275	Not trapped	2	137 8 0
12-4-1927 ..	" <b>Cape Cross</b>	330	1	4	82 8 0
8-6-1927 ..	" <b>Seattle Maru</b>	175	Not trapped	4	43 12 0
18-6-1927 ..	" <b>Tressellon</b>	390	Nil	2	195 0 0
25-7-1927 ..	" <b>Baron Lovat</b>	390	Nil	Nil	390. No rats.
26-8-1927 ..	" <b>Aronda</b>	220	Not trapped	37	5 15 1
		2,950		65	

@ Rs. 45-6-2 per rat.

**45.** International Aspects of Disease with Special Reference to Quarantine. **Graham, J. D.,** Col. C.I.F., I.M.S. (*Public Health Commissioner with the Government of India*).

This paper contains a brief review of the factors leading up to the present co-ordination of various national and international activities having for their main object the rapid assembly of more accurate world-epidemiological information with a view to simplification of quarantine procedure consistent with safety to national public health, and with due regard to the claims of commerce for consideration in the matter both of extra financial dues and of vexatious delays on shipping. It deals briefly with the influence which the "Office International d'Hygiene Publique" and the League of Nations Health Section have exerted in this connection and with the effects of the new position in a country such as India with a huge indigenous and largely illiterate population.

**53** Experimental Observations on Activated Sludge in Calcutta. **A. D. Stewart,** Lt.-Col., I.M.S. (*Professor of Hygiene, Calcutta School of Tropical Medicine and Hygiene*).

The results of experiments with diffusers, surface aeration and aspiration on raw sewage, septic tank effluent and Calcutta sewage respectively. The rate of development of full activation in tropical conditions is noted; the stages of chemical activity are distinct and correlated with bacterial development.



Purification of Calcutta sewage with an active sludge takes place after 4 hours' aeration, "Fungus" infection of sludge is common and deleterious. Observations on the protozoal life suggest that certain protozoa are commonly present, in active sludge (vorticella, carchesium, coleps, paramoecium, prorodone, aspidiscis).

Nitrate and nitrate forming bacteria were cultivated in liquid and solid media. The organisms found were non-motile, gram positive and cocco-bacillary. No swarming stage was observed.

B coli reduction was proportional to the time of aeration and practically complete in 24 hours' aeration.

The macro and microscopical appearances of good and bad sludges are described.

Exhibits illustrating the paper are in the scientific exhibition.

**63.** The Present Position of the Plague Problem. **Mackie, F. P.**, Lt.-Col., O.B.E., I.M.S. (*Director, Haffkine Institute, Bombay*).

#### I. The rodent factor.

Conditions of the rat epizootic in India.

The infection of veldt rodents in South Africa.

Ground squirrels and plague in California.

Tarabagans and plague in Transbaikalia.

Plague in South Russia and the associated rodents.

#### II. The ecto-parasitic factor.

The relation of rodents and their ecto-parasites to plague epizootics.

The carrying over of epidemics.

Chronic or residual plague and the flea problem.

The relative importance of *X. cheopis*, *X. astia* and *X. Brabii* in India.

Climatic factors and their influence in epizootics.

#### III. The Human factor.

The world-wide distribution of plague.

The relative frequency in different countries.

The rise and fall of plague in India.

Prophylaxis by Haffkine's vaccine.

Serum therapy.

Bacteriophage treatment.

**75.** Recent Work on Sprue. **Mackie, F. P.**, Lt.-Col., O.B.E., I.M.S. and **Fairley, N. H.**, M.D. (*Haffkine Institute, Bombay*).

I. *M. psilosis* (Ashford) is found in the majority of cases of sprue but is present in similar proportions in cases of 'diarrhoea not sprue and in healthy persons.

II. *M. psilosis* is toxic to rabbits by intravenous inoculation producing focal nephritis and death. It is less toxic by other routes and generally produces localised abscesses.

III. The study of the hepatic function by levulose tolerance and bromsulphalein dye tests does not bear out the contention that the function of the liver is seriously at fault.

IV. The study of the intestinal digestive juices indicates that the fat protein and sugar splitting enzymes are acting normally. Any serious derangement of the pancreas is therefore unlikely.

V. The study of the morbid anatomy and histology of sprue does not reveal any pathognomonic lesions. A general condition of aplasia with probable loss of absorptive power is found in the small intestine but it is difficult to say whether this is the cause or the effect of the disease.

VI. The blood in sprue shows changes of an aplastic type which is borne out by the condition of the bone-marrow. The blood picture is different from that seen in pernicious anæmia.

VII. Bacteriology of the intestine. No bacillus peculiar to sprue has been found. The commonest organism of pathogenic significance is a "morgan"-like bacillus. A vibrio-like organism has been recovered from the duodenal contents and the blood of three cases but its significance is not known. Hæmolytic bacteria are commonly found in sprue stools, a fact which may throw some light on the anæmia.

VIII. Sprue is regarded as a clinical entity quite distinct from pernicious anæmia. The following reasons may be adduced.

(1) In sprue the patient is progressively and profoundly emaciated.

(2) Achlorhydria though sometimes present is not invariable.

(3) The blood picture differs from that of pernicious anæmia.

(4) The bone-marrow is generally aplastic.

(5) Spinal symptoms are rarely if ever seen in sprue.

(6) Recovery is frequent in sprue but rarely or never occurs in pernicious anæmia.

**101.** Note on the Preparation of Mutton Broth with Papain. **Martin C. de C.**, Major, M.B., Ch.B. (Ed.), D.T.M. and H. (Lond.), I.M.S. (*Pasteur Institute, Rangoon*).

During the early part of our work on Bacteriophage at the Pasteur Institute, Rangoon, we used Martin's broth exclusively, this

medium being recommended by Dr. d'Herelle as the most suitable for the purpose.

When however we commenced the preparation of Bacteriophage on a comparatively large scale for testing its therapeutic value in the treatment of Bacillary dysentery, it became evident that a substitute for Martin's broth would have to be devised, a substitute that could be administered to all communities, easily prepared and of low cost.

Lt.-Colonel J. Morison suggested that Papain, the dried juice of the Papaya fruit, might prove to be an efficient substitute for pigs' stomachs in the preparation of Martin's broth. A sample of Papain was procured from Ceylon and the following tests carried out.

25 grammes of finely minced beef and 100 c.c. of water were placed in each of a number of 200 c.c. flasks. A quantity of Papain was ground up in a mortar and from this gradually increasing quantities ranging from 0.25 per cent. to 15 per cent. of the weight of mince taken, were added to each flask. The flasks were then placed in a water bath at 60°C. for six hours and at the end of that time the amount of digestion noted.

A second series of flasks were put up in the same manner except that in this case the contents of the flasks were acidulated with dilute hydrochloric acid.

At the end of six hours, broths were prepared from each flask and tested for its power to grow Dysentery bacilli and also for the degree of lysis that took place when suspensions of Dysentery bacilli were acted on by Bacteriophage.

It has been found by repeated experiments that the best broth is obtained when about 6 grammes of Papain are added to 100 grammes of mince without the addition of acid, the Papain itself being decidedly acid to Litmus paper. More rapid and complete digestion takes place when the temperature of the water bath instead of being maintained at 60°C. is gradually raised to 80°C. after two or more hours at the lower temperature.

The next step was to substitute mutton mince for beef. The experiments were repeated and found to correspond in every way to those done with beef mince. The following is our routine method for preparing mutton broth and we have been doing this for several months.

#### Stock A.

1. Rub up 300 grammes of mutton mince freed from fat, in a mortar with 20 grammes of powdered Papain.

2. Stir in gradually 200 c.c. of distilled water and transfer the whole to a large flask. Add 1 litre of distilled water.

3. Place the flask in a water bath at 50°C. for two hours and during the next two hours gradually raise the temperature to 80°C. This latter temperature should be maintained for two hours, i.e., till six hours in all have been completed. The flasks should be well shaken every hour.

4. Raise the temperature to boiling point to stop further action of the Papain and cool.

5. Strain through a thick wet cloth, make distinctly alkaline to Litmus by adding a sufficient quantity of normal caustic soda and steam in the steamer for 30 minutes. Cool.

6. Filter through Kieselgurh deposited on filter paper.  
Stock B.

1. Add 500 grammes of mutton mince to a litre of distilled water and steam for one hour.

2. Strain through a wet cloth, make distinctly alkaline to Litmus, steam for 30 minutes and filter through filter paper.

When required for use, mix equal parts of A. and B. Steam for 30 minutes, cool and filter. Adjust the hydrogen ion concentration to 7.8, tube or place in flasks and autoclave.

The broth should be perfectly clear and of a light golden colour.

The cost of preparing a litre of this broth in Rangoon is roughly Re. 1-6 against Rs. 3-2 for the same amount of Martin's broth.

Individual samples of Papain vary somewhat in their digestive powers. Each sample should be tested on receipt from the makers. The minimum amount giving complete digestion in 6 hours should be used. Excess of Papain apart from being wasteful gives rise to a heavy precipitate on the addition of caustic soda when making the broth alkaline to Litmus. This necessitates more frequent filtrations. It also tends to darken the colour of the broth giving it a somewhat greenish tinge.

#### *Conclusions.*

In our hands this mutton broth has given as good results as Martin's broth; a good bacillary growth is obtained and lysis takes place rapidly and completely on the addition of Bacteriophage.

It is not open to the obvious objections to Martin's broth when used for internal administration in the East.

The cost of preparation is considerably below that of Martin's broth.

It can be prepared in half the time.

I am indebted to Lt.-Colonel J. Morison, I.M.S., Director of the Pasteur Institute, for his help and many valuable suggestions.

**113.** The Theory and Practice of Malaria Control. **Gill, C. A.,** Lt.-Col., I.M.S., D.P.H., D.T.M. and H., (*Chief Malaria Medical Officer, Punjab, 1913—1923, Director of Public Health, Punjab*).

#### I. Preliminary Remarks.

#### II. The Theory of Malaria "Control."

(a) Quinine Medication.

(b) Anti-Mosquito Measures.

(c) Biological "Control."

#### III. The Biological Method of Malarial "Control."

#### IV. Conclusions.

**115.** Remarks on Anti-malarial Measures for Poverty-stricken Regions. **James, S. P.,** M. D. (*Adviser on Tropical Diseases, Ministry of Health, London*).

The following remarks on anti-malarial measures are concerned only with the malaria problem in Europe and only with the problem in areas where very little money is available. I think no excuse is necessary for confining them to the European problem because that is a subject which, up to the present, has not received the attention it deserves. As regards the limitation to malarious districts where very little money is available, that is a limitation rendered necessary by the circumstances in which malaria occurs as an endemic and epidemic disease in Europe. Let me give you an example. At the present time Bulgaria is endeavouring to make arrangements for the prevention and control of malaria among nearly two million peasants of Bulgarian nationality who have returned to their own country as refugees from Macedonia, Thrace, Yugo-Slavia and Asia Minor since 1912. These refugees, consisting of about 32,000 families, are mostly homeless and without land. They must be settled in rural districts and the only way in which that can be done is to distribute them in and around existing villages, most of which unfortunately are already very malarious. The majority are being settled in the Government of Burgas where (as will be seen from the slide shown) the average spleen rate is over 40 per cent., about 75 per cent. of the enlarged spleens reaching nearly to the umbilicus. The breeding places of the malaria-carrying anopheles are exceedingly numerous and extensive, consisting of lakes, swamps, borrow pits, mountain streams, rivers and irrigation ditches. At present in these villages the only assistance available in cases of sickness is such as can be given by the village schoolmaster or priest who is provided by the Government with a supply of quinine to be distributed to anyone who may ask for it. For the purpose of settling refugees on the land, the Government, backed by the League of Nations, has obtained a loan of about 2½ million pounds, which is about £1 per head of the number of refugees concerned. This loan is required to be repaid in 20 years by the refugees themselves with interest at 7 per cent. In order to place the refugees in a position to earn the bare necessities of life and to pay the interest on the loan, practically all the money available must be spent on reclaiming land so as to make it suitable for cultivation, and on providing houses, agricultural implements, seed and cattle. When this has been done little money will be left even for ordinary medical assistance; and any expenditure on preventive measures which may not be immediately productive of material results in money or kind is hardly to be thought of.

There are problems of the same kind and with similar financial difficulties in Italy, Serbia, Greece, Roumania, Albania, Russia and other countries of South-Eastern Europe. In malarious areas of those countries there are many people who, from lack of means, are obliged to live in huts which are little better than the huts of primitive man, and there are people who have no hut of their own but live (as Celli has described) like modern troglodytes in caves excavated in the

rocky hills or like nomads in make-shift tents. It may interest you to see a few photographs of those people and their dwellings.

Now it has to be admitted that in circumstances of poverty such as those to which I refer, there is not, and perhaps never will be, enough money to apply the methods of malaria control which have proved effective in certain small and relatively wealthy areas in various parts of the world. No one doubts the efficacy of those measures when they can be thoroughly applied, but everyone agrees that they are difficult and very expensive.

Therefore it is immensely important to endeavour to discover a method of dealing with malaria which can be effectively applied with the small amount of money that is usually available in the type of malarious district to which I have drawn your attention.

You are doubtless aware that in May 1923, the Health Committee of the League of Nations appointed a Commission whose task it is to endeavour to solve this problem for Europe. The Commission is an international group of malariologists and public health officers. Most of its members are workers in Europe, but the membership also includes Dr. Chagas of Brazil, Dr. Raynaud of Algeria and Col. Christophers of British India. Their inclusion does not mean that the mandate of the Commission extends beyond Europe. I think I should make this quite clear by saying that the object of the tours of enquiry of the Commission in Palestine, the United States and one or two other countries outside Europe has been solely to gather experience which may be useful for the solution of the European problem.

Up to the present the Commission has published two general reports, several special reports on particular study-tours in different countries, and one laboratory report. In the second general report, a summary is given of the present views of the Commission on measures for dealing with malaria in Europe. The Commission has not yet succeeded in finding a simple and cheap method of dealing effectively with the disease in poverty-stricken districts. They believe that the best prospect of success in this quest lies in a renewal of activity in the research of malaria in all its aspects. In the report mentioned, an endeavour is made to bring this view to the notice and urgent consideration of European governments, and two methods of enquiry which might be profitably pursued are suggested.

But the Commission does not, for a moment, contemplate the cessation of anti-malarial efforts while that research is being pursued. Therefore the main part of the report is concerned with suggesting to the European governments concerned the measures which seem justifiable in the present stage of knowledge and experience. In the time allotted I can only deal briefly with these suggestions in a general way. They are based on the view that, because no royal road nor short cut to the prevention of malaria by breaking one of the links of the epidemiological chain has yet been found, the wisest course

that European countries with limited funds can adopt at present is to continue to combat the disease itself on its appearance in the human and insect hosts. As regards the disease in the human host it is advised that the first aim should be to reduce its severity rather than to aim immediately at reducing its incidence. The results of the Commission's enquiries seem to show that when attention is directed chiefly to reducing the severity and duration of malarial attacks, rather than to reducing incidence, the disease soon ceases to be of importance from the public health point of view. Here is a slide which shows this phenomenon in North Holland. You can see that there is still quite a considerable incidence of malaria in that country but local study will convince you that as an appreciable factor in the state of the public health the disease long ago lost all its importance. A similar result has come about unconsciously in several other European countries and in many parts of the United States of America. In these places the disease was robbed of its importance without any reduction of anopheles mosquitoes and, in some places, even before the rôle of the mosquito was known. As regards the disease in the insect host, it is the case in Europe that malaria-infected mosquitoes are found almost exclusively inside human dwellings and usually, indeed, only in dwellings where a member of the household is suffering from the disease. Therefore the Commission considers that the systematic killing of blood-filled mosquitoes which can be found in the interior of dwelling-houses should everywhere be attempted.

Both the above measures are classified as "direct". Among indirect measures, the Commission attaches most importance to agricultural and industrial welfare schemes which aim at improving the economic and social conditions of the people and their general well-being and standard of life. The Dutch "polders" and the Italian "bonifica" are schemes of this kind. They are not concerned with the reduction of mosquitoes. Their object is primarily social—to change a poverty-stricken, sparse, scattered, often semi-nomadic, population into one which is settled and well-to-do, with proper arrangements for housing, water-supply, education and general welfare and with adequate medical attention. A change of this kind does not eradicate the causes of endemicity and the sources of malaria, but it quickly brings about a cessation of severe and fatal cases and a significant reduction of bad effects so that the disease comes finally to be of little or no importance as a cause of sickness and death.

Anti-larval measures, in the general environment are classed by the Commission as a very indirect method of attempting to deal with malaria. The Commission does not doubt that in Europe the present abundance of *Anopheles maculipennis* can be materially reduced in some localities by anti-larval measures persistently carried out in accordance with the most modern methods, but during all their journeys in different countries they found only a very few localities in which it could reasonably be hoped that those measures could be prosecuted with any hope of obtaining sufficient success to warrant the large staff and great expense that would be necessary even for a

limited campaign. Therefore they hope that in most malarious localities of Europe the cheaper and less difficult anti-malarial measures which they suggest will suffice to bring about the limited result towards which they think the malarious countries of Europe should aim.

**116. Experiments on the Treatment of Malaria in England.**  
**James, S. P., Nicol, W. D. and Shute, P. G.**

I wish in the first place to refer to some studies which are different in some respects from those that are usual in connection with research on the treatment of malaria. They are concerned not so much with the action of quinine or other drugs on the malaria parasite, as they are with the natural processes or artificial conditions which protect certain individuals from the usual clinical and parasitological effects of a malarial infection, or which free some individuals very quickly from those effects without the assistance of quinine or other drug. It seems possible that, if more knowledge of those natural processes or artificial conditions were available, it might lead to practical measures of material assistance in limiting the present importance of malaria as a cause of sickness and death.

One of the most striking results which has emerged from work on induced malaria in England is that a malarial attack does not always result when a person is bitten by anopheles which are proved to be infective by finding sporozoites in their salivary glands after they have bitten the patient. At first there was a difference of opinion on this point. Yorke and Macfie reported that, in their experience of 41 cases, the bites of a mosquito which, immediately after the meal, was proved by dissection to contain sporozoites in the salivary glands, had never failed to result in a malarial attack within the usual incubation period of the disease. In our observations, however, there had been, up to April 1926, 52 failures to develop malaria among 221 patients bitten by mosquitoes of infective batches, and our total figures up to the middle of September 1927 are 169 failures among 576 patients. For some time we tried to explain our failures on technical rather than on biological grounds, but later we were able to prove conclusively that it is quite true that not everyone who receives a dose of sporozoites develops an appreciable malarial attack within the usual incubation period of the disease. The proof came when some of our patients who had been reported as having "failed to take," and in whom a reinoculation was not done, developed a true malarial attack some months after they were bitten. Here is a temperature chart of one of these cases.

It is seen at once on this chart that the individual did not show the effects of the infection during the period when a primary attack was due, but that nine months later he developed a typical attack.

In this case no sign or symptom indicated that the inoculation by mosquito bites had successfully infected the patient. Equally interesting are a number of cases with a modified or "abortive" primary



attack from which the patients recover without the attack being observed clinically or, if it is observed clinically, without parasites being found in the blood and without any quinine treatment. In these cases, as in the case first mentioned, the occurrence of an obvious malarial attack some months later proved that the patient had been successfully infected when he was originally bitten.

Of a similar type are cases in which the primary attack is observed clinically and by finding parasites in the blood, but in which there is so-called spontaneous recovery in a few days without quinine treatment.

These charts, of course, relate to persons who had never previously suffered from malaria. They had never been out of England. It has to be admitted that at the time of their inoculation some natural process or artificial condition was at work which prevented the development of the malarial infection.

Quite a different subject is the condition of immunity to a strain of the Benign Tertian parasite which, it must now be admitted, occurs in individuals who, as a therapeutic measure, are given two or three courses of malaria induced either by mosquito bites or by direct blood inoculation. The usual events in these cases are that the attack caused by the second inoculation dies out "spontaneously" after a few febrile paroxysms and that the attack caused by a third inoculation either fails entirely, or only shows itself by the presence of a few parasites without fever or other clinical manifestation.

This subject is obviously very important not only in connection with experiments on the treatment of malaria, but also from the epidemiological point of view. At Horton we have made the surprising observation that patients who have been rendered so immune to our strain of *P. vivax* that they can be repeatedly bitten by many infected mosquitoes without showing any clinical or parasitological evidence of infection, can be readily given another attack of Benign Tertian malaria with the usual incubation period and the usual clinical and parasite findings if they are inoculated with a *different strain* of the same species of parasite (*P. vivax*). As a rule, however, the attack due to this different strain dies out spontaneously after a short series of febrile paroxysms.

It is evident that each of the observations I have mentioned has an important bearing on the treatment of malaria which we cannot afford to neglect in experimental work—particularly in work on the action of quinine and other drugs. It seems from these observations as though a chief aim of experimental work should be to ascertain how to assist the physiological protective and curative processes which many individuals seem naturally to possess. In some individuals there is such a nice balance between the natural protective or curative power and the effects of the parasitic invasion that it can be influenced

by very slight external stimuli such as warmth and cold, exercise and rest. It is curious that nearly all our "failures to take" have happened during the winter months and that during those months some patients who were kept in bed in a warm room throughout the incubation period developed the disease while others who were allowed to be up and about in the cold failed to do so. Cold weather seems to assist the natural curative processes and in this connection one is reminded of the common observation that patients suffering from tropical malaria due to *P. falciparum* become free from their infection very quickly in the cold climate of England. As regards the effect of exercise, we have a patient who keeps free from fever and parasites while she remains at rest in bed but gets a relapse a day or two after she is allowed up and takes exercise.

In our experiments on the use of quinine for the treatment of malaria we are trying to follow up the ideas just indicated by endeavouring to ascertain the utility of the drug as a stimulus of the natural curative processes rather than as an agent in killing the malaria parasite.

The first chart that I show in this connection illustrates our practice of stopping attacks of therapeutic malaria about the middle of their course by giving the patient one dose of 5 grains of quinine. This single dose causes the attacks of fever to cease almost at once and it causes the parasites to disappear from the peripheral blood within 2 to 4 days. It seems to set in motion some natural process of cure which continues for a considerable time after all the quinine has been eliminated. But the cure is not complete, for, after an interval of freedom from fever and parasites which corresponds rather closely to the incubation period of the primary attack, there is a recrudescence resembling the primary attack but usually less severe.

Other results which we have ascertained regarding the effect of a single dose are: (1) A single dose, even of 30 grains has no effect if given at any time during the incubation period of the disease, even on the day before the first rise of fever; (2) The single dose, given about the middle of the attack, must be sufficiently large, but by increasing it beyond that amount no better effect is obtained. For example, a dose of 2.5 grains has usually no curative effect; and a dose of 10 grains or a dose of 20 grains has usually no greater curative effect than a dose of 5 grains.

On this point the next slide shows how ineffective it is to give quinine during the incubation period or even on the first day on which fever appears.

The next charts are examples of recrudescences and relapses. If there is a return of fever and parasites within six weeks of an attack we call it a recrudescence, if the interval is longer than six weeks we call it a relapse. I may say at once that recrudescences after

a relapse are more frequent than recrudescences after the primary attack.

Slide No. 8 illustrates one recrudescence after the primary attack and three recrudescences after the true relapse.

The treatment in this case was 10 grains three times a day for 10 days in the primary attack and 10 grains three times a day for 5 days in the true relapse. No quinine was given for the treatment of any of the three recrudescences following the true relapse; recovery from them occurred without any treatment and the patient has not since suffered from any symptom of a recurrence of the disease.

The next chart is of a case in which the interval between the primary attack and the recrudescence was as long as 5 weeks (34 days).

Both the primary attack and the recrudescence were treated with 10 grains of quinine 3 times a day for 5 days. The patient had a true relapse 6 months after the recrudescence but she recovered from it without quinine and has not since had a recurrence.

So much for recrudescences. Now I would like to show a few charts illustrating true relapses. These relapses are more interesting than recrudescences because it seems probable that their causation is entirely different. A reasonable explanation of a recrudescence is that not all the parasites in the red blood corpuscles have been killed, or have died a natural death, but this explanation is not reasonable for a relapse which suddenly occurs without any warning 8 months after a primary attack which may have been so mild as to be unobserved. It is very curious that such a high proportion of these true relapses occur at about the 8th or 9th month after the primary attack. This fact recalls to mind various articles in the early literature of experimental malarial infections, particularly an article by P. Thurnburn Manson entitled "Experimental Malaria: recurrence after nine months" published in the *British Medical Journal* of July 13th, 1901, and an article by Major C. F. Fearnside, I.M.S., entitled "Experimental inoculation of malaria, with a relapse after eight months" published in the *Indian Medical Gazette* of January 1903. From the point of view of the present paper, the chief interest of those cases was that the primary attack was treated with large daily doses of quinine and that after recovery from the attack quinine treatment was continued for a long period—apparently at least three months.

In the first chart of our cases which I show, the primary attack was treated with 10 grains of quinine three times a day for 5 days. No further quinine was given:

The second chart is of a patient whose primary attack was treated with 5 grains of quinine three times a day for ten days:

For the last two charts which I propose to show I have selected cases in which the relapse occurred at an interval of about six months.

They are noteworthy also on account of the large doses and long duration of quinine treatment in the primary attack, the relapse and, in the second case, the recrudescences which followed the relapse:

Comparing these charts with those previously shown, it is evident that a plan which would usually be termed thorough and prolonged quinine treatment and after-treatment of the primary attack has no more effect in preventing a true relapse than has a plan which until recently would have been condemned as being quite inadequate.

In conclusion I should like to make it clear that in my opinion it would be a great error to assume that the results obtained in England would be equally applicable to the treatment of malaria in tropical countries. I feel very strongly that until we know more of the natural processes and artificial conditions governing the so-called "spontaneous" cure of malaria and its failure to develop as a clinical disease in some classes of individuals and in some climates or seasons, we must regard its treatment by drugs as being a "local problem" quite as truly as is any other public health method which has been tried or suggested for dealing with the disease. We do not know at all whether such small doses of quinine are as effective, let us say in England, or Holland or the United States of America, would be equally effective among the people of India or of West Africa. It seems as though a long series of local researches on this subject would be necessary and I do not see how they can be avoided.

**117. Habits of Anopheles in Relation to their Rôle in the Spread of Malaria. Importance of monthly differences in the length of life of *A. maculipennis*. James, S. P., Nicol, W. D. and Shute, P. G.**

I propose to draw attention to one of the results which emerge from the arrangement which exists in England for providing supplies of infected mosquitoes to be used for inducing an attack of malaria in patients suffering from certain mental diseases. At the British Ministry of Health we began to prepare batches of infective mosquitoes for that purpose in December 1923 and, except for an interval of about five months in 1924, we have prepared one or more infective batches each month since that time. Up to October 1927, we have prepared 41 batches. During this period of more than 3½ years we have not found it necessary to vary our routine technique for preparing infective mosquitoes. To begin the preparation of a batch we collect about 300 or more specimens of *maculipennis* in the adult stage, and we feed them upon a suitable case daily and incubate them at 23°C. until they become infective. During this procedure, which occupies roughly a fortnight, a large number of the mosquitoes die. If we begin with 300 mosquitoes, it often happens that only 100 or less will be available on the date when sporozoites are first present in the salivary glands. The following is a statement of the numbers of mosquitoes used during each of the different months comprised in a period of more than 3 years, and the numbers (and percentages) which survived until they became infective:

	Number of mos- quitoes at the beginning of the procedure.	Number which survived to become infective.	Percentage which survived to become infective.
January .. ..	380	116	30%
February .. ..	130	35	27%
March .. ..	665	162	24%
April .. ..	550	96	17%
May .. ..	334	21	6%
June .. ..	1,298	213	17%
July .. ..	1,800	239	13%
August .. ..	1,700	724	42.5%
September .. ..	500	265	53%
October .. ..	330	220	66%
November .. ..	740	176	23%
December .. ..	300	47	15%

It can be seen at once that many more mosquitoes die in some months than in others. If we try to prepare an infective batch in June, less than 2 per cent. of all the mosquitoes with which we begin the batch will be alive when the batch becomes infective, but if we prepare a batch towards the end of August or in September or October, at least 50 per cent. of the mosquitoes with which we begin the batch will be available for use in infecting patients. The percentage of survivals falls again in November, and after remaining at about the same level until the end of March, drops suddenly in May and June and begins to rise again in July. The lantern slide which I show, illustrates the phenomenon.

Before considering the significance of this diagram in relation to the spread of malaria, I must refer to the probable cause of the high death rate of our mosquitoes in some months (particularly May to July) and the low death rates in other months (particularly August to October). We think that the cause has to do with growth and maturation of the eggs and with oviposition. If one collects adult female *maculipennis* in England in May and June, one finds that the ovaries are well developed in nearly all, and that in a very few days the eggs become ripe and must be deposited. The period is one of great peril to the mosquito's life and not many of them survive it. In those that succeed in living through this critical time, a second batch of eggs begins to develop almost at once, with the result that within a few days the insect has to go through a second dangerous

experience of the same kind, to be followed (in the rare event of survival) by a third. Undoubtedly this is the chief cause of the very low survival rates of *maculipennis* during the early summer months in England.

Now towards the end of August the findings rather suddenly change. One no longer finds that the majority of adult female *maculipennis* caught in nature contain developing ova. There is an almost complete cessation in the growth and maturation of the eggs, a cessation which seems to be independent of atmospheric temperature—for when these insects are fed upon patients and incubated as usual, no increase in the size of the ovaries is observed. Being free from the trying ordeal of egg development and oviposition the insect lives much longer and, as our figures show, more than half the number of mosquitoes with which our batches are begun, survive many weeks. It is by using mosquitoes collected at this period of the year that we have been able to prove that malarial zygotes and sporozoites are still active after the mosquito which harbours them has lived several months.

One other point in the figures remains to be explained, namely, the drop in the percentage of survivals among mosquitoes caught in November and subsequent winter months. These mosquitoes are those which have already lived as adults in nature in a hibernating or semi-hibernating condition for some weeks or months according to the date when they were caught. During this wintering life, ovarian development goes on, but so slowly as to be inappreciable to the naked eye. In ordinary circumstances in nature it goes on so slowly that the ova of wintering mosquitoes do not show signs of growth until April. But the ova of some of these mosquitoes are evidently ready for this growth at any time from late November onwards, for some of them begin to grow rather quickly when the mosquitoes are subjected to the artificial warmth of our incubator (23°C.). Their development is not nearly so rapid as in mosquitoes caught in May and June but it is sufficient to cause some of the mosquitoes to undergo the peril of oviposition during the period of infection. This causes the fall in survival rates during the winter months, which the chart shows.

The lessons of these observations from the point of view of the spread of malaria seem to be: (1) that in future we must endeavour to correlate the seasonal incidence of primary malaria, not with the seasonal prevalence of the mosquito concerned, but with the seasonal prevalence of the individuals which live long enough to be transmitters. In June there may be an enormous number of adult *maculipennis* in a malarious place, but if we know that during that month less than 2 per cent. of them live long enough to become transmitters of the disease, their abundance is not so important. Obviously it is much less important than a smaller abundance in August or September; the simple calculation from our figures that 100 mosquitoes in September are equal in importance to 3,000 in June does not by any means express the true difference because the September mosquitoes will live several months while the June mosquitoes will live at the most only a

few weeks; (2) If the process of egg maturation and oviposition is such an important cause of death that it almost entirely prevents the transmission of malaria by anopheles during the months of its occurrence, the number of broods that each species has in different localities and the period of the year during which maturation of eggs and oviposition occurs ought to be worked out much more carefully than has hitherto been attempted in many places. The results may provide a clue to the explanation of some observations on malarial incidence which are at present obscure.

**118.** On the Malarial Endemic in the Central Part of Japan.  
**Katsumi Katsumo**, Colonel, I.J.A.M.C. (*Professor of the Army Medical College, Tokyo*).

1. The Malarial Endemic in Central Japan.

The malarial endemic in the central part of Japan is most prevalent in its centre, namely, the vicinity of Lake Biwa, and is rare in other districts. Accordingly some of the physicians living in other districts where malaria does not occur are destitute of experience with this disease. Tertian malaria is the only kind prevalent in Central Japan and the other kinds of malaria occasionally found there are the result of infection from outside Central Japan.

In Central Japan, new patients of malaria appear after the middle of June every year and the disease shows a rapid increase after the middle of July, but a marked decrease early in September. A slight increase is again seen in the middle of September, but a rapid decrease towards the end of the same month, and there are almost no new cases in October. The only species of the Anopheles found in Central Japan is, so far as I know, *Anopheles sinensis*, which begins to appear about the middle of May and early June of every year and entirely disappears in October.

Of the fifty or sixty cases of malarial patients which I examined among the troops in Japan proper from the latter part of autumn to the spring of the following year, every one had the history of previously suffering from this disease within the preceding ten months and many gametes could be demonstrated from the time of the onset of the disease. Therefore it would be no great error to consider all of them to be relapsed cases.

Although it is a very difficult task to decide whether the new malarial patients who begin to appear from the middle of June every year are those who have been infected by the *Anopheles* mosquitoes which have survived the winter or by those which have been newly born, yet we have the following facts:—

1. No larvæ of the *Anopheles* are found in the central part of Japan before the middle of May.

2. The Eggs of the *Anopheles* mosquitoes laid in the latter part of autumn pass the winter in mud, etc., and become imagoes under favourable conditions of temperature in the following spring.

3. Female *Anopheles* can pass the winter, lying hidden in the straws or on the inner side of straw roofs. But on examining 109 female *Anopheles* in the malarial district from December to April of

the following year for the past ten consecutive years, I could find no malarial parasites among them.

4. I bred 27 *Anopheles* mosquitoes, making them bite and suck the blood of patients carrying many gametes of tertian malaria, and making three of them once more bite and suck the blood of the patients. I examined all of the 27 *Anopheles* mosquitoes during the months from October to December, but found no imago in them.

From these facts, it may be supposed that the malarial parasites in the body of the *Anopheles* are likely to die when the temperature falls, and accordingly there may be no cases of malarial infection by the *Anopheles* mosquitoes which have just passed the winter.

By various methods of provocation of parasites on the plasmodium carrier, I found only gametes, especially macrogametes in his peripheral blood. If the gamete is the principal factor which causes the relapse of malaria, why are there so many more relapsing patients in summer than in winter and also why do the cases in which no plasmodium could be demonstrated in winter relapse in summer? It may be of course due to the fact that in summer, there are many newly infected patients and the relapse will be caused by the stimulation of labour, etc., but also to the fact that there may be such a marvellous mechanism in living things that, in winter, the malarial parasites lie hidden deep in the human body in a dormant state, but they appear again on the surface of the human body when mosquitoes appear in summer.

I have observed 735 cases of malaria in the malarial district for the last twenty years. The age and sex distribution of these cases is shown in Table I.

From the table we see that the number of patients are few in 1—5 year old infants and many in 6—15 year old children. This may be due to the fact that infants are comparatively well protected against the bite of mosquitoes, apart from the question whether they have the congenital immunity against this disease. In that district, there is the custom of putting the infant under the mosquito net day and night in order to protect it against mosquitoes and flies. The reason why the patients above the age of 21 years rapidly decrease in number is because they do not receive medical treatment, as the symptoms of their relapsing fever become mild, or they become immunized. The reason why in 21—30 years of age there are more female cases than male is because many women coming from the other non-malarious districts in Japan to work in sericulture, filature, and tea-manufacture are infected by malaria.

Of the 735 cases mentioned above, exclusive of 59 cases of which the dates of onset are unknown, 676 cases are shown in Table II, distributed by months, which on the whole coincide with the monthly distribution of the cases among the Japanese military troops for ten years, namely, from 1916 to 1925 (Table III).

As soldiers of the Formosan troops are very few compared with those of the troops at home, the percentage of the patients among the Formosan troops is very great. Especially the number of patients



TABLE I.

*Age and sex distribution of the malarial patients treated at my residence in the malarial district for the last 20 years.*

		NUMBER OF PATIENTS.		
	Age.	Male.	Female.	TOTAL
1—5	..	26	22	48
6—10	..	74	75	149
11—15	..	98	74	172
16—20	..	71	56	127
21—25	..	39	47	86
26—30	..	22	26	48
31—35	..	19	13	32
36—40	..	16	8	24
41—45	..	8	5	13
46—50	..	9	6	15
50 and upwards	..	14	7	21
TOTAL		396	339	735

TABLE II.

*Showing the monthly distribution of malarial cases treated at my residence for the last 20 years.*

Month.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL.
o. of patients.	15	19	14	11	13	86	152	147	97	58	28	26	676

TABLE III.

*Showing the monthly distribution of malarial cases among Japanese military troops for ten years from 1916 to 1925.*

Month.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL.
Troops in Japan proper.	128	80	76	167	526	1327	1987	2136	1653	802	233	187	9302 (including 1 death).
Troops in Formosa.	252	201	195	246	416	832	1024	776	639	670	840	505	6596 (including 14 deaths).

in winter is far greater among the Formosan troops than among the troops at home. Among the troops at home, the number of patients rapidly decreases in winter, while among the Formosan troops, the number of the cases only gradually decreases.

In my several experiments concerning malarial infection in the human body, I studied the mode of multiplying of parasites and the outbreak of the disease as follows: I made 11 *Anopheles* mosquitoes suck the blood of the patient carrying many gametes of tertian malaria, and 25 days after sucking, I made the *Anopheles* bite myself and my three assistants, and at the end of 22 days, there were found in one of my assistants 22 malarial parasites in 1 c.mm. of his peripheral blood, but without any subjective symptom, and afterwards the number of the malarial parasites numbered 1,072 in 1 c.mm. of the peripheral blood and after nine hours the attack appeared.

## 2. Method of Treatment.

I tested various kinds of drugs especially for the treatment of tertian malaria, and decided their efficacy according to the decrease in the number of malarial parasites found in the peripheral blood, their injured phenomenon, the influence on the symptoms, recurrence of the disease, etc. But whatever method of treatment may be used, the recurrence of the disease is usually unavoidable sooner or later, unless the after-treatment is employed.

1. For the cases of tertian malaria and quartan malaria, administration of doses of 0.4 to 0.5 gm. each of chin. hydrochloric at two times, 8 and 5 (or 4) hours before the attack, is recognized to be most effective, by which the chills are stopped in almost all cases. In this treatment, schizonts disappear from the peripheral blood in 15—20 hours, and gametes in 25—35 hours, after administration of the first dose.

2. 0.5—1.0 gm. of chin. hydrochloric given at one time 5-6 hours before the attack is far less effective than the above treatment and no injured phenomenon appears in some schizonts.

3. Nocht's method of treatment is very convenient, but less effective than the first method.

4. Administration of a too small dose of chin. hydrochloric seems rather to raise the resistance of the plasmodium.

5. The resistance of the malarial parasites against chin. hydrochloric is generally weakest in macrogametes, and somewhat developed schizonts seem to have stronger resistance than those which are more developed, and macrogametes are the strongest in resistance.

6. A dose of 0.4—0.7 gm. of methylene blue given for a day at 4 or 6 different times is less effective compared with Nocht's method, but appears to act with comparatively great strength on young schizonts, especially on those young schizonts which have passed several hours after entering the red blood corpuscle.

7. 12 c.mm. each of the blood serum which was taken from a patient recently infected by malaria but not yet treated, was injected into a patient of tertian malaria during the apyrexial period and before the attack, but with no effect.

8. Intravenous injection of neosalvarsan into the tertian malarial patient, 0.15 gm. during the apyrexial period and 0.3 gm. five hours after the attack, does not show any remarkable effect in many cases. But, if salvarsan is used when chin. hydrochloric becomes less effective after continuous administration, the chin. hydrochloric which is used afterwards will become fully effective.

9. I have observed that for the prevention of tertian malaria, it is most effective to give 0.4—0.5 gm. of chin. hydrochloric for a day at two different times at intervals of 4 hours in the afternoon on every tenth day.

10. As the after-treatment of tertian malaria, 0.4—0.5 gm. of chin. hydrochloric is given for a day at two different times on every 8th day.

**123.** Progress towards the Realization of Biological Control of Mosquito Breeding. **Senior-White, R.**, F.R.S., F.R.S.T.M. and H. (*Malaria Research Officer, Central Malaria Bureau*).

At present mosquito control is affected almost entirely by mechanical means, either by drainage works involving always considerable and often extremely heavy capital expenditure, with subsequent low upkeep charges, or else by the application of larvicides which not only involve continuous costs for periodical application, but often in addition a certain amount of drainage works to concentrate water within treatable limits.

Beyond these methods, there is at present only one method of true biological control, which has been practised from earliest times, the use of larvivorous fish; but save in circumscribed areas such as wells and cisterns, where there is space in the ecology of Nature for them to exist in sufficient numbers to be effective, this method has neither yielded, nor promises to yield, any useful results. The hopes which have sometimes been based on the method have proved extravagant, for in large bodies of water the natural enemies of the fish keep their numbers, as elsewhere in Nature, within normal limits, and control, in the sense that connotes virtual, if not entire, inhibition of larvæ reaching the adult stage, is not attainable. In such waters it appears to be impossible to alter greatly the resultant of the equation "fish-foal-enemies," though it must be admitted that very little study has been extended to the bionomics of larvivorous fish, at least in Asia, with a view to increasing their efficiency.

The same remark applies to various aquatic Rhynchota and Coleoptera, many of which are extremely vicious predators on mosquito larvæ.

The discovery by MacGregor (1921) of a connection between the hydrogen-ion concentration of water and the species of mosquitoes breeding therein at once moved the problem on to another plane. Here appeared to be a Pisgah-site of biological control of mosquito-borne diseases, not, as in the case just considered, by attempting to influence the bionomics of animals as equally enwrapped in an ecological mesh as the mosquitoes themselves, but simply by rendering dangerous waters unsuitable to breeding by means which, though

never specifically defined, are none the less clearly visualizable. It is of course a truism known to every worker that in any area, however malarious, the proportion of the total extent of water used for breeding carrier species is very small indeed. Prior to MacGregor's discovery this fact had been accepted without search for an explanation, though Watson (1920) had drawn attention to the phenomenon and had suggested that the explanation lay in "something in the quality of the water," which could be made use of for biological control, but following on MacGregor's discovery, the search was taken up in several directions at once.

Buxton (1924) made a series of pH observations in Palestine, but their number was small, and the results inconclusive. MacGregor (1924) continued his English observations in Mauritius, and reached the generalization that the Anophelines are alkaliphiles, the Culicines generally acidophiles. He also made the observation, which followed on Watson's classic "felled agra" observation, that dhobyng and the discharge of sugar factory effluent into a stream rendered it sterile for a considerable distance, but he does not seem to have tried to correlate this observation with pH determinations.

The present author (Senior-White, 1926) published the first long series of records of larva pH findings, made in the island of Ceylon, and though, for each species, there appeared to be an optimum value, the range found for the majority was very wide, almost, in fact, that of the whole series of waters examined. The conclusion is that only extremes of acidity and alkalinity are inhibitory, but from an investigation of the "residual pH" that is the value after expelling  $\text{CO}_2$  by shaking or boiling, it was found that for Anophelines at least, acidity other than that due to  $\text{CO}_2$  is definitely inhibitory. The first conclusion, that only extremes of "natural" pH have any inhibitory effect has been confirmed by experimental work by Buxton (1927).

Failing thus to find the necessary explanation in hydrogen-ion concentration, the author in the same paper gave the results of the investigation of the values of dissolved oxygen, total dissolved solids, and saline ammonia in various waters. Again, it appeared that there were specific optima in respect of dissolved solids, and that where sea-water influence is concerned, there are actual biological races of the various species in this respect, which will be further confirmed when the results obtained by me when surveying the new Imperial Harbour at Vizagapatam are published. In respect of dissolved oxygen it was found that in general a low content was unfavourable to most species, and in rice fields it was shown that there was an apparently close relationship between rises in the oxygen content and the entrance into the fields of the carrier species *A. funestus*. Finally, the tentative conclusion (for the number of observations was small and the method crude), was reached that saline ammonia in higher quantity than one part per million was absolutely inhibitory to the presence of Anophelines other than the *rossi*-Group.

It should be mentioned that a year earlier than the commencement of author's investigations Lamborn (1922) had published a few chemical analyses of waters, but his results hardly suggest any factor

as dominant. Simultaneously with the present author's work in Ceylon Hacker (1924) showed *A. maculatus* and *A. kochi* following, inversely and directly respectively, the albuminoid ammonia curve.

Williamson (1926), continuing Hacker's work in Malaya, like Senior-White and his predecessors encountered little that was helpful in pH. He also found extreme natural acidity inhibitory. This author has made considerable study of the effects of peat, an opportunity vouchsafed to him alone, as peat is absent from all but very high elevations in India and Ceylon, and his detailed results will be awaited with the greatest interest.

The present author, again, travelling over wider and more diverse areas of this country than any other worker on pH has been enabled to do elsewhere, made in 1925-6 a further considerable series of pH observations, not yet published, which will again only show that there is nothing in pH *per se*, and that the optimum values found in his Ceylon work are almost certainly only applicable to the country at that time investigated, and would not apply elsewhere, thus answering in the negative the question propounded on this point in my paper of 1926.

This year, *pari passu* with the malaria survey of Delhi on which I am now engaged, investigations have been undertaken into the following factors. The area investigated is practically totally distinct from all other portions of the East where similar work has been done, though most of the species are of wide occurrence thereover. The country around Delhi is typical of the vast expanse of the Indo-Gangetic Plain.

hydrogen-ion concentration.

"residual pH."

Dissolved solids.

Dissolved oxygen.

Carbonates and CO<sub>2</sub>.

Phosphates.

Saline and Albuminoid Ammonia.

These investigations are as yet uncompleted and unpublished, but as they have been continued at the time of preparing this MS. for seven months, a brief summary of the results will perhaps be of interest.

1. Hydrogen-ion concentration of itself explains nothing.
2. "Residual" pH is always alkaline, as found in Ceylon, but as no natural pH of lower value than 7.0 has been found, this can hardly be said to confirm the Ceylon result.
3. Total solids in solution are generally very much higher than was found in Ceylon. Optimum values are thus shown to be purely local, and are probably merely correlated to another, and controlling, factor.
4. Carbonate and CO<sub>2</sub> do not, of themselves, explain anything, but as I hope to show in a subsequent paper, based on results obtained partly in Delhi (for alkaline soils) and partly in Ceylon, (for acid soils), there are very high

correlations between the "movable carbonate" and the pH, and between the total carbonate and the conductivity. Though this is what one would expect theoretically, it may serve as an indirect means of approximating the carbonate values, the direct measurement of which involves titrations not very suitable for field work.

5. Phosphates, investigated for their probable effect on the micro-plankton that forms the larval food, have almost always been present in quantities sufficient to rule them out as a factor indirectly affecting the presence or absence of larvæ. With their enormous and universal pollution bodies of water around a great City are not suitable areas for the investigation of this point. I am, however, of the opinion that it may be of great importance in the economy of the stream breeders that cause hill foot malaria and are absent from the great Plains.
6. Dissolved oxygen, which yielded promising results in Ceylon streams, has not done so here. The amounts found by the Winkler process used have often appeared impossible for the very polluted waters examined. The point was submitted to Dr. W. R. G. Atkins, F.R.S., perhaps the greatest authority on water biochemistry, who, after further consultation with Dr. Ramsden of Trinity College, Dublin, is of the opinion that the values are false, and are due to nitrous acid released from nitrate when the HCl is added to the precipitate, which itself also releases iodine from the iodide, and thus stultifies the final titration. As Dr. Atkins has pointed out to me, the Winkler process has seldom been made use of in the foul morasses which interest the malarialogist.
7. Complete confirmation of my Ceylon result of the inhibitory effect of saline ammonia in higher concentration than 1 p.p.m. has been obtained. A series of 154 determinations made up to the date of preparing this MS. showing only six exceptions. Of these, four belong to the *rossi*-Group, the remaining two to *culicifacies*, represented, however, by but three individual larvæ only.

The ammonia ratio discovery is not, as I for long imagined, new. Waddell (1903) discovered that very small amounts of ammonia are fatal to mosquito larvæ. I have not been able as yet to consult the original paper, but I have failed to reproduce the fatal effect in the laboratory, with eggs of the *rossi*-Group, using concentrations far higher than anything ever found in Nature. Advices of his latest, unpublished work by Williamson, indicate that the true inhibitory effect is not ammonia *per se*, but the ammonia-nitrate ratio. This may explain the failure of experiments to confirm observed facts. The investigation of the point for India is about to be commenced, but too late to yield results this season. If confirmed, I think that the apparent relationship with dissolved oxygen found in Ceylon falls into line with the discovery.

The bearing of these discoveries by Waddell, whose claim to priority I am thus very glad to bring before this Meeting, the author and Williamson, on the nitrogen cycle in water with reference to Anopheline breeding promises at last to lead to a practicable method of control, applicable at least to standing water breeding grounds, though not to swift streams or hill foot seepages. In the nitrogen cycle proteids (determinable as albuminoid ammonia), are broken down to ammonia by a great variety of saprophytic bacteria, but from that point the organisms concerned in the cycle are specific. *Nitrosomonas* alone can convert ammonia to nitrites, and *Nitrobacter* alone can carry the process forward to nitrates. Now following on the original work of d'Herelle, Gerretsen, Gryns, Sack and Sohngren (1924) have isolated a bacteriophage for a nitrifying organism, *B. radicola*, and there is every hope by a modification of their method of similarly isolating bacteriophages for *Nitrosomonas*, and *Nitrobacter* if required, whereby the ammonia-nitrate ratio should be regulatable at a concentration inhibitory to the breeding of carrier Anophelines. The Dutch authors, moreover, have shown that their product is highly resistant to heat and desiccation, engendering the hope that a breeding place such as a depression that dries for part of the year, once inseminated, would remain more or less permanently sterile.

**129. The Future of Malaria Control in the Federated Malay States. Watson, Sir Malcolm, M.D., LL.D. (Klang, F.M.S.).**

At the sixth congress of the Far Eastern Association of Tropical Medicine, Dr. Wellington, then Senior Health Officer, Federated Malay States, read a paper entitled "The Ways and Means adopted by the Government for the Control of Malaria in the Federated Malay States." As the title indicates, the paper is confined largely to the means adopted by Government to Control Malaria. But as is well known the most cordial co-operation exists between the Government organisation and many private organisations to control the disease, a co-operation the result very largely of Dr. Wellington's own tact in meeting the men of his profession, and inspiring them with the knowledge that his one aim is to assist in every way possible all who were fighting disease in the country. From his paper, it will also be gathered that Administrators, Engineers, Planters and others work along with medical men in controlling malaria. The present paper deals with no far distant control, but with that to be attempted by the Central Health Board—a Board Incorporated in the F. M. S. by the "Health Boards Enactment, 1926." This enactment is due to Sir George Maxwell, until recently the Chief Secretary to Government, F.M.S. In a paper read before the Royal Colonial Institute on 8th May, 1927, Sir George describes how he decided that this enactment was necessary and gives a description of its extent and powers. He enunciated the following propositions:—

- (1) Every land proprietor is under the burden of carrying out proper and reasonable anti-malarial measures upon his land; provided

that in the case of small holdings and towns and village areas, the Mosquito Destruction Board may assume the burden, and recoup itself by an assessment;

(2) The railway is responsible for railway reservations, and the Mosquito Destruction Boards for all State lands and reservations;

(3) In order that anti-malarial measures may be effectual, there should be co-operation of proprietors of contiguous estates among themselves and with the Mosquito Destruction Boards and the Health Officers.

The Provisions of the Health Boards Enactment are, briefly:—

There is a Central Health Board, with a marked preponderance of unofficials. The Board is a body corporate and appoints a salaried full-time Administrator. It can employ and pay its own staff of medical officers and can also employ and remunerate the private medical practitioners who have done, and are doing, wonderful work, both curative and preventive, for the rubber estates. Local Health Boards are appointed by the British Residents after consultation with the Central Board, and are put in charge of specified areas known as Local Board Areas. The Local Board submits to the Central Board its recommendations. . . . . The Central Board may require any scheme to be amended. The Central Board has power to levy a cess, which the Government land officers collect.

As a result of this enactment, anti-malarial work will spread from the many centres now existing over the whole land. The present generation should see malaria disappear entirely from much of the country, and exist as a rare disease in the remainder.

“For a bold, comprehensive, and generous scheme, aiming at the maximum of co-operative private enterprise, and minimum of Government control, it would be difficult to find an equal any where in the world to this piece of legislation” writes Sir George Maxwell, with pardonable pride in his connection with it.

Such legislation has been possible in Malaya for several reasons:—

(1) The Malay States have already 27 years' experience in the practical work of controlling malaria both in urban and rural areas.

(2) In Malaya people realise that mosquito control and malaria control are not only possible, but are desirable economically, and financially practicable, and this although many conditions favour malaria being at its maximum intensity.

(3) Research has taken a foremost place in the work. Hamilton Wright, Daniels, Leicester, Stanton, Strickland, Hacker, Lamborn, Williamson have all carried on research work on malaria and mosquitoes; since 1912 there have been whole-time Malaria Research Officers.

(4) The importance of species Sanitation was early recognised.



(5) Experimental Research on a large scale has been carried out, and has guided practical work. A highly developed malaria-control technique has been evolved.

(6) The cost of malaria control when converted into the currencies of countries where the value of the unit coin lower than the Straits Dollar appears at first sight to be excessive, if not indeed prohibitive, but

(7) When the high rate of wages paid to the agricultural labourer in Malaya is considered, it will be found that malaria control would cost no more than is paid on an average to the Indian labourer in Malaya for 3 days' work. This sum, by keeping him in good health, enables him to earn much more than he would do were he living in an area where malaria is not controlled.

**130.** Organic and other Chemical Factors which Influence the Breeding of Anopheline Mosquitoes, etc., "Dr. Williamson, (College of Medicine, Singapore).

Records of larval habit usually relate to some physical or geographical feature, such as running water, marsh, etc. Such descriptions do not admit of precision. In recent years a few chemical studies of anopheline breeding waters have been made, notably by Purdy in America and Senior-White in Ceylon; and many observers, hoping for a simple criterion, have recorded pH values. Is there a practical justification for more extended enquiries? To answer this question, we must ask two others, namely:—Do chemical studies promise (1) More precise definitions than topographical ones, (2) Prospects of cheaper and wider control of breeding? The answer to both these questions is in the affirmative, but not all chemical characteristics of water are equally important. We may for convenience consider them under four headings in two main groups:—

(a) Inorganic content, divisible into

1. Mineral.

2. Gaseous ( $\text{CO}_2$ ,  $\text{O}_2$ ,  $\text{CH}_4$ ,  $\text{H}_2\text{S}$ ).

(b) Organic content, namely,

1. Solutions derived from the disintegration of wood cellulose, and other carbohydrates.

2. Proteins nitrogenous bases, and amino acids, etc.

Changes in all four subdivisions produce pH changes, so that these stand in the relation of a resultant to the whole complex, which includes many factors to which larvæ are indifferent. This amounts to saying that sharp and invariable correlations with hydrogen-ion concentration are not to be expected, unless it acts potently and directly upon larvæ. This is not the case within the ordinary range of its occurrence.

The above factors considered. Mineral constituents affect vegetation more than larvæ. Iron present in organic combination indicates

excess of organic matter but of very little direct importance. Organic factors important. The efficient oxidation of proteins most important, and determines the suitability of water for different anopheline species. Discriminants of this. The nitrate to ammonia ratio, other suggested discriminative ratios, and ammonia. Protein rot occurring under conditions of inefficient oxidation, and excess organic matter inhibit breeding, especially of many important malarial vectors. Possible reasons for this. Practical applications. The need for extensive research in all countries. Desirability of common objectives and standardised methods in the interest of comparative studies. Proposal that a committee should report on these

**207.** On the chronicity of Malaria in Formosa. **Morishita, K.** (*Laboratory of Medical Zoology and Malariology, Government Research Institute, Formosa*).

**208.** Ein neuer weg zur Zucht von Malaria Parasiten. **Grauert, H., Dr.** (*Japan*).

**209.** Experimental Yaws and Study of Immunity to Yaws. **Schöbl, O., Dr.** (*Bureau of Science, Manila, Phillipine Islands*).

**210.** Experimentelle studien über Reisschaden an Tauben mit Reis verschiedenen alters und verschiedener Shalart. **Kessler, A., M.D.** (*Professor of Pharmacology, Tung-Chi University, Shanghai*).

The paper deals with tests made with rice of different ages ranging from 1 to 6 years and with different peelings.

As test objects pigeons have been used. The tests have been conducted on more than a hundred pigeons in about two years' time and, as far as was possible, these have been separated in accordance to the different age of the rice respective to the detection of beri-beri and its prominence. The tests will be at a later date further conducted on account of the fact that the detriment done to the pigeons by the rice is not directly identical to beri-beri, so the findings in the pigeons are only indirectly converted.

**211.** Studien über das neue synthetische Analptikum Cardiazol.

**212.** Über Ephedrin und das synthetische Ephetonin. **Kessler, A., M.D.** (*Professor of Pharmacology, Tung-Chi University, Shanghai*).

The papers deal with experiments with Cardiazol and also with comparative studies effected with adrenaline, Ephedrine and Ephetonine.

**213.** Rhinosporidiosis in Cattle. **Krishnamurti, V., G.M.V.C., I.V.S.** (*Professor of Pathology and Bacteriology, Madras Veterinary College, Madras*).

The author reviews very briefly cases of human Rhinosporidiosis hitherto recorded.

In animals only 3 cases have been recorded, one in a horse by Zschokke and the other two in mules by Quinlan and De Kock in South Africa. In all these three cases the lesions were in the nasal cavity.

No cases have been recorded in any animal in India where the disease appears to be prevalent in man.

The possibility of its occurrence in cattle suggested itself to the author while he was engaged in investigating a disease condition in cattle known as "Nasal granuloma" or "Snoring disease" in which growths were found obstructing the nasal cavity. In these growths the author was able to find an organism akin to Actinomyces bovis but differing from it in being relatively acid and alcohol fast. The results of the investigation were published in the year 1922 in the Madras Veterinary Journal and later as one of the Memoirs of Agriculture in India entitled "Nasal granuloma in Cattle" in the year 1923.

During February of this year material which was purported to have been removed from the nasal cavity of a bullock suspected for Nasal granuloma was received by the author. The specimen showed peculiar cauliflower-like appearance and was studded with a number of irregular, smooth granular growths which were easily friable. Histological examination showed the presence of cysts quite identical with Rhinosporidium seeberi.

The discovery of this parasite in cattle in India where cases of Rhinosporidiosis in man have been reported raises a very important issue whether the parasite found in cattle is the same as that found in man or allied to it. It would also appear that the cause of Nasal granuloma in cattle is not of one etiological entity but of two, namely, an organism akin to Actinomyces bovis which is present in most cases and a Rhinosporidium.

**214.** Quarantine conditions in the Port of Calcutta. **McVail, J. Borland,** M.R.C.S., L.R.C.P. (*Port Health Officer, Calcutta*).

The limits of the Port and the approaches thereto. The duties of the Bengal Pilots in relation to infectious disease. Regulations regarding reception of ships into Calcutta. River quarantine moorings. A note on rat mortality. Pratique. Sanitary conditions in Port. Sanitary Authorities. Endermic Disease. Precautions against export of disease.

**215.** Some Clinical Observations pertaining to Intestinal Tuberculosis in India. **Wanless, W. J.,** M.D., F.A.C.S. (*Mission Hospital, Miraj, Bombay*).

1. Incidence in West and Southern India.
2. The Disease as observed in a rural hospital of 150 beds.
3. Predominance of disease in India as compared with cases recorded in the literature of England and America.
4. Predisposing factors obtaining in India.
5. Age and sex.
6. Clinical course.
7. Diagnosis.
8. Surgical treatment.

**216.** The development of Gastric Surgery in India with special reference to Gastric and Duodenal Ulcer. **Wanless, W. J.,** M.D., F.A.C.S. (*Miraj, Bombay*).

*I. Past History:—*

- (a) some early observations as to incidence.
- (b) Personal experience in the nineties, reference, paper and discussion, Bombay Congress, 1909.

*II. Present-day status.*

- (a) Incidence and Hospital Reports.
- (b) Modifications of earlier conceptions in respect of etiology.
- (c) Personal observations in the surgical treatment.
- (d) The relation of peptic ulcer to gall bladder disease and appendicitis in India.

*III. Trend of Present-day treatment in India.*

- (a) Medical *versus* surgical treatment.
- (b) Desirable administrative change in large medical clinics.

**217.** The use of Æthoxy-diaminoacridinlactate (Rivanol) in Tropical Colitis. **Urcha, O.,** M.D. (*Member of the German Society for Tropical Medicine*).

In December 1926, the author published from Dutch Guiana a preliminary report (*Archief. Schiffs-und Tropenhygiene—Journ. f. Marine and Tropical Hygiene*) of 7 cases of Tropical Colitis treated with this acridin compound. The first case was of uncertain origin, amœba hystolytica in repeated examination of the movements not being found, nor eggs from *Schistosomum Mansoni*. Bacillary dysentery in that part of the country being extremely seldom, was not taken into consideration.

The next four cases were typically of amœbic origin, the last two cases belonged to Schistosomiasis Mansoni.

All cases were treated with enemas of Rivanol 1-1000, viz., 1-2000, and recovered very quickly. Movements became formed in the average after 3 days, amœbæ or cysts were not seen neither in regular stools nor after provocation with Karlsbad Salt.

The author does not decide whether there was a specific action of the drug against the amœbæ, as the few cases were of different origin.

Dr. Peter of the same Hospital (Mining Hospital of the Aluminum Co. of America) has had the chance to see 2 of the patients with amœbic dysentery 1 year later. Both were well, did not have relapse movements, were free from cysts.

Dr. Pater has treated a second lot of patients during 1926-27, all with the same result. He decreased the dilution to 1-5000, the results still being the same. This paper is in press of the *Münchener Medizinische Wochenschrift* (Medical Gazette Munich).

Experiments carried out from the laboratory of Prof. Laulenschlaeger Hoechst am Main had the following result.

(a) *Biological Experiments.* In vitro Rivanol kills *Entamoeba histolytica* in a very short time, the dilution being 1-2000—1-5000. Yatren 105 in still stronger concentration did not show any result.

Infected cats were treated, when the disease was in full course. Rivanol cured the disease, if administered rectal, peroral or combined peroral and rectal.

From the different Acridin-dyes Rivanol showed the best action.

(b) *Pharmacological Experiments.* Rivanol relaxed spasmodic contractions of the intestines, set by Pilocarpin or Bariumchloride. The effect was equal to Benzylbenzoate or Papaverin. (Hence the action against Tenesmus.)

*Toxicity.* Doses of 1 gm. (16 grains) were well tolerated by middle-size dogs. 0.2—0.3 gm. were well tolerated by cats.

**218.** Birth rate and Mortality of Europeans in the N. E. I. **Winckel, C. W. F.,** M.D. (*Inspector of the Public Health Service, West Java Division*).

**219.** Osteomalacia in India. **Scott, A. C.,** M.B. (*C. M. O., Women's Medical Service, India, and Secretary, Countess of Dufferin's and allied funds*) and **Stapleton, G.,** M.D., W.M.S. (*Delhi*).

Geographical distribution of the disease found to be distinctly local (map). Madras Presidency the chief exception. In Northern and Eastern India and Kashmir the disease prevalent. Certain castes and communities are more affected than others, e.g., Hindus, notably the Baxia and Kshatta castes in North India. Mohomedans, notably the Bohra community in the West. Insanitary conditions, lack of sunlight, lack of exercise found to be predisposing causes. Disease is confined to women chiefly of the child-bearing period. Influence of child marriage, prolonged lactation, and the purdah system. Tetany a common accompaniment. Osteomalacia in connection with pregnancy, parturition and lactation. Prevalence of disease as judged by number of Cæsarian sections performed in 30 hospitals for women in North India during the last 10 years.

Late rickets and Osteomalacia in Delhi. An analysis of 73 cases.

**220.** Operative Midwifery in the Pre-Chamberlen period with special reference to Ancient India. **Das, Kedarnath,** C.I.E., Dr. (*Principal, Carmichael Medical College, Calcutta*).

**221.** Mooren's Ulcer. Its Pathogenesis and Treatment. **Bhadhuri, B. N., M.D.** (*Hon. Ophthalmic Surgeon, Out-patient Dept., Sambhu Nath Pandit Hospital, Calcutta*).

Two cases cited where operative interference (conjunctivoplasty) succeeded in arresting the spread of the ulcer.

**222.** Ocular findings in amœbic dysentery. **Bhaduri, B. N., M.D.** (*Hon. Ophthalmic Surgeon, Sambhu Nath Pandit Hospital, Calcutta*).

Examples of, iritis occurring in amœbic dysentery. A case of chronic ulcer of the cornea beneficially influenced by emetine injections. Loss of accommodation occurring in a subject of amœbic dysentery.

**223.** Chinese Drugs. **Dr. Kubota** (*Mukden*).

**224.** Diseases of Faulty Nutrition. **McCarrison, R., C.I.E., M.D., F.R.C.P., I.M.S.** (*Director, Deficiency Diseases Inquiry, Indian Research Fund Association, Pasteur Institute, Coonoor*).

**225.** Organisation of Child Welfare Work. **Tilak, H. V., M.B.** (*Bombay*).

1. Need of paying more attention to Antenatal work and of educating the mother in Mothercraft. The question of Dietetics has so far received scant attention though it is of great importance. Mothers must know which foods are cheap and yet nutritious and full of accessory factors and how to prepare them.

2. About 80 per cent. of the Infantile Mortality occurs in the first fortnight after delivery and is largely preventable by efficient Antenatal and Neonatal supervision and care of the mother.

3. A systematic organization of child welfare work on approved lines is necessary in order to prevent overlapping of work and wastage of money and energy. The workers must be imbued with the preventive and educative nature of the work otherwise Child Welfare Centre degenerates into merely a dispensary for children and a Depot for the supply of milk.

4. Need of an officer, male or female, in every Province in order to give expert advice to and supervise the work of the various Child Welfare Organizations in the Province.

5. Successful organization of Health and Baby Weeks during the last few years has attracted considerable attention of all sections of the public to the health conditions of mothers and children and is gradually dispelling the notion that poverty is mainly responsible for the abnormally high disease and death rate in them. *Statistics of the Bhatia Maternity Hospital and Health Visiting Service.* It is being increasingly realised that (1) ignorance of the parents in the hygiene of mother and child, (2) the prevalence of harmful customs, and (3) the absence of welfare measures such as the appointment of Midwives

or establishment of Child Welfare Centres and Maternity Homes are in a large measure responsible for the abnormally high disease and death rate in mothers and children.

6. This has led to a demand for more midwives and Lady Health Visitors. Two practical difficulties are encountered, viz., funds and trained workers. The funds will be forthcoming when the public realises the importance of starting Child Welfare Schemes even from the economic point of view. Less diseases and deaths mean saving of so much money in the nursing and treatment of disease, and better earning power again means increase in wealth. Educative propaganda as carried on by the holding of Baby and Health Weeks is therefore essential and should be expanded.

7. Establishment of small Maternity Homes with some paying beds in all Municipal towns with over 5,000 population will be found to be a practical proposition and useful in many ways in popularising Child Welfare work.

(a) In such towns it costs from Rs. 20 to Rs. 30 for every delivery case and its nursing for 10 days even when the same is done by an untrained *dai* in the house of the mother. It is not difficult to induce mothers to go to a Maternity Home for delivery and pay the home from Rs. 15 to Rs. 25 for ten days' stay in the home. Three classes paying beds may be maintained so as to suit all pockets and free beds may be kept for the poor. This arrangement will secure a large proportion of the current expenses of the hospital.

(b) The out-door department will serve well, at a small extra cost, for an Antenatal Clinic and an Infant Welfare Centre to be worked on alternate days. An experienced midwife paying occasional visits to the mothers in their homes will popularise both the Maternity Home and the Child Welfare Centre.

(c) As the majority of cases will be normal cases it is not essential to have a Resident Lady Doctor if funds are scanty. A private qualified male doctor practising in the town can visit the Home everyday for general inspection and at other times when called for treating abnormal labour cases on a small honorarium.

(d) The Maternity Home will be useful for many villages in the neighbourhood of the town in case of abnormal labour as the same can be sent to this Home.

(e) A visiting Midwife can attend at the most 10 delivery cases in a month but in a Maternity Home two Midwives can attend even forty deliveries or more in the same period. Again in the house daily attendance of the midwife can only be of the nature of a visit while in the Maternity Home there is usually a constant attendance.

(f) Probationers can be trained as Midwives and professional *daïs* or rather their daughters can be engaged as *ayals* and instructed in the observance of cleanliness and non-interference after which they can practise in the villages where trained midwives are not available.

It is necessary for the success of these Homes that they should not be a part of a general hospital where male cases are also received. They should be in the heart of the town and not outside

it as many of the Municipal dispensaries and hospitals are. They should be under the management of voluntary body with Government or Municipal subsidy and supervision. This arrangement will tend to make both the Home and the Welfare Centre more popular. The preliminary expenses should be met by the Local Bodies and if suitable building is not available free of charge the same may be rented rather than spending money over a new building to start with.

9. Maternity Homes started and conducted on such lines will be to a large extent self-supporting and thus offer a solution for the scarcity of funds. The actual working of such Homes will prove a potent factor in dispelling wrong notions about Maternity and in giving practical instructions to the mother.

10. The question of finding a sufficient number of trained workers is also causing great anxiety but if probationers are trained in all these Homes and such training can be given at a little extra cost—the number of Midwives can be rapidly increased. The shyness and ignorance of the girls prevent them from going to large towns for training but they can be induced to go to such small Maternity Homes nearer their homes.

11. It is still more difficult to get suitable candidates to be trained as Midwives. Most of those that apply have not sufficient preliminary training even in their mother tongue. There is a large class of such girls—mostly young widows—available for this work but unless some arrangement is made for their preliminary training *free of charge* not much headway can be made. The Poona Seva Sadan Society have succeeded in tapping this source and turning out a large number of trained Midwives and Nurses. The Society admits such girls and gives them preliminary training so as to fit them for a Midwives' or nursing course. If they are poor all the expenses are borne by the Society on a written understanding that they are to repay their debt when they are employed as trained workers.

**226.** Some suggestions for the further development of Child Welfare Work in Bengal. **Headwards, Alice, M.D. (Calcutta).**

1. Efforts now being made are sporadic and undertaken largely by voluntary associations with no "official" recognition from Government. There is a great lack of uniformity and co-operation.

Great need therefore for :—

(1) The appointment of specially trained officer by each Provincial Government to direct the work in the Province under the D.P.H.

(2) To obtain the best results by standardization and uniformity, it is necessary to have in each Province a "Health School" provided by the Provincial Government for the Training of Health Visitors with a uniform standard of training.

(3) In each Province one "Model" Child Welfare Centre; if possible in close touch with a well-equipped Maternity Hospital—and a "Mothercraft" School where women can be admitted for a few days if necessary.

2. Causes of "Infant Mortality."



Very little known as to actual "Causes" in India. A great deal of material can be supplied and utilized in a properly equipped Welfare Centre with a specially trained staff to carry out Ante and Post-Natal Research Work.

### 3. Criticisms of existing Child Welfare Centres.

(1) Great tendency to convert "Clinics" into small dispensaries and in some centres in the mill areas Health Visitors are employed to do the work of doctors.

(2) Too little educational work done.

(3) Ante-Natal Work not sufficiently emphasized.

(4) Tendency to "give" and "do" everything and not make the people "do" themselves.

(5) Need of the medical profession themselves to disassociate the work of "Cure" with "Prevention."

"Prevention" must be the key-word at the Centres.

### Summary.

Great need for the Provincial Governments to interest themselves in Welfare work by the provision of:—

(1) Specially trained officers.

(2) The establishment of Health Schools.

(3) Model Infant Welfare Centres and a "Mothercraft Training School"—with a specially trained staff for the investigation into the causes of Infantile Mortality in India.

**227.** Some Observations on Indians in regard to the Sugar Content of Blood and the Sugar Tolerance Test. **Bhatia, S. L.**, Capt., M.C., M.D., I.M.S. (*Professor of Physiology, Medical College, Bombay*).

Investigations were carried out on apparently normal human subjects, all Indians, in Bombay, with a view to obtain normal standards regarding the sugar content of blood. The tolerance for sugar was also ascertained according to the test advocated by H. Maclean. 50 grams of glucose dissolved in 150 c.c. of water was given by mouth in the morning after the night's fast, or  $4\frac{1}{2}$  to 5 hours after the last meal. Blood sugar was estimated at half hourly intervals for two hours after the administration of glucose. Urine was also examined for sugar before and at definite intervals after the administration of glucose. All the blood sugar estimations were carried out according to Maclean's Method for .2 c.c. of blood. It was generally observed that the average fasting level of blood sugar was a little higher and the sugar tolerance a little poorer in persons, who lived on a purely vegetarian diet rich in Carbohydrates, than in those who lived on a mixed diet of meat and vegetables. These observations confirm those of McCay and others. I believe that the Glycosuria which is so common in this country is mainly dietetic in origin. It is suggested that in persons living on a rich Carbohydrate diet the glycogenetic function of the liver is strained too much and leads to a deficiency in the storage mechanism. This eventually

in a number of cases is followed by damage to the B. Cells of the islets of Langerhans, producing true Diabetes.

**228.** Vesico-vaginal Fistula. Dr. **Webb, M. V.**, W.M.S. (*Agra*).  
*Etiology:*

Rare in Western countries, therefore a somewhat neglected subject in literature; common in India. Varieties of cases.

*Preparation for operation:*

Time; general preparation.

*Details of operation:*

Preparation; position; instruments; operation and sutures.

*After treatment:*

Modification of procedure when urethra is in fistula edge. Treatment of cases where fistula is inaccessible or for some other reason inoperable.



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